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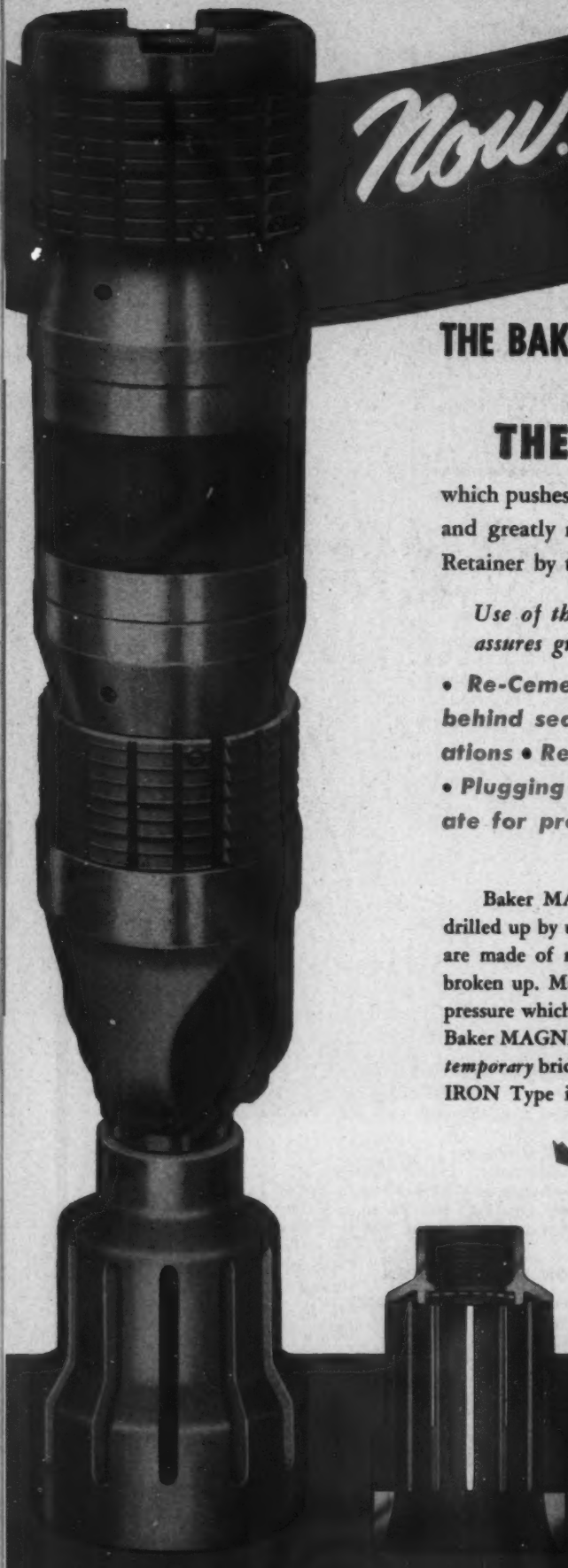

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We Pose a Question

WE have entered the month of greatest gasoline consumption, and if predictions of a few weeks ago materialize there will be consumers at scattered points who will not have their wants supplied 100 per cent.

This situation poses the question as to which groups of customers deserve first consideration when shortages develop. There are several offshoots to this question. Should gasoline consumers be rationed in order to provide furnace oil for the coming winter? Is it sound to expand fuel markets when government observers insist that we are confronted with a permanent shortage of domestic supplies, and millions are being spent by federal agencies looking to the commercial production of petroleum substitutes from coal and shale? In brief, does it make economic sense to take additional markets from the coal industry with low-priced oil fuel which is potential gasoline, and then turn around and try to perfect methods of manufacturing petroleum substitutes from coal at three or more times present costs based on crude oil?

So far as this year's shortages are concerned their background has been fully explained. They come from insufficient transportation facilities, an inevitable aftermath of war and postwar conditions, and are being corrected. As to domestic supplies no one can project trends until the producing division has had time to offset with expanded exploratory operations the enforced curtailments of the war involving materials and manpower.

But with a return to normal conditions we take the unqualified position that the industry's first duty is to supply all petroleum markets for which there are no substitutes comparable in price and service. In addition to motor fuels these include diesel fuel, tractor fuel, most uses of kerosine and other burning oils, asphalts, lubricating oils, and a long list of specialty products. Most military requirements, regardless of product involved, come within this classification.

To meet the demands for intermediate products the gasoline yields at many refineries since the war's end are less than they were prewar, although substantially greater yields are possible from the newer plant processes. The refining industry for years had an uninterrupted record of increasing gasoline yields, and it was assumed that as the manufacturing arts improved and prices justified, these recoveries could be increased to 65 or more per cent for the industry as a unit and still supply all indispensable demands for other products.

Admittedly a discussion of this kind can quickly get into deep water because of the varying and often conflicting interests involved. But the domestic industry may be entering a period in which, to check the political activities of those who would control it, production and reserves must be reevaluated in terms of maximum yields of essential petroleum products.

PETROLEUM—A *PROGRESSIVE* INDUSTRY

U. S., California Sign Agreement On Interim Operation

by Henry D. Ralph

WASHINGTON.—Crude production from submerged lands off the coast of California will continue as at present until September 30, 1948, unless in the meantime some other arrangement is determined by Congress or the Supreme Court, it is agreed in a stipulation announced July 26 between the federal Government and the State of California.

It is purely an interim stipulation and settles nothing permanently except the minimum boundaries of three bays which the federal Government concedes are inland waters entirely within state jurisdiction. These are San Francisco Bay, San Diego Bay, and part of San Pedro Bay off the city of Long Beach. Therefore those Long Beach wells which are draining an area within the boundary line named in the stipulation are permanently excepted from all federal claims, while all other wells in the tidelands area are still subject to dispute.

Production from all tidelands wells is to continue under the term of all state and municipal leases which were in effect on June 23, 1947, the day of the Supreme Court decision affirming the federal Government's right to the ocean bottom below the low-tide mark. A joint press release by the Departments of Justice and Interior stated that uninterrupted production is necessary and that representatives of the major oil producers affected have given assurance that they will continue production under the terms of the stipulation.

New Leases

There is no provision for issuing new leases by either the state or federal Government. The only additional wells which may be drilled into the marginal sea are offset wells to prevent drainage or to protect the respective interests of the United States and California. Such offsets, and any new leases necessary to permit them to be drilled, are to be under state jurisdiction but must have the specific advance approval of the secretary of the interior.

All oil and gas producer from the disputed area is to be free from any claim by the federal Government, and it is stipulated that purchasers are entitled to deal in it on the same basis as any other oil.

The producing companies, however, are still in jeopardy of being consid- so decide. The federal Government reserves all rights to make claims for damages against any lessee or grantee of the State of California for operations below the low-tide mark prior to June 23. As to operations since that date, the Government limits itself to a maximum claim for the value of the oil or gas extracted from federal property without interest, after deduction for all costs.

California is to continue to collect rents and royalties, but will segregate them and hold them in a separate fund until final determination of their disposition, reporting them quarterly to the secretary of the interior. Monthly reports will be made to the Interior Department on production from each lease, and the state is also to furnish complete well records of all existing and new offset wells.

Two Separate Stipulations

Two separate stipulations are involved, one defining the areas which the Government admits are inland waters of the state, the other relating ered trespassers, if Congress should to petroleum operations. Both were signed by U. S. Atty. Gen. Tom C. Clark; J. A. Krug, secretary of the interior, and Fred N. Howser, attorney general of California. They will be filed with the Supreme Court, and they state that they will not be deemed to abridge the power of the court in entering a decree to carry out its opinion, nor will they be affected by the state's pending petition for rehearing the entire case.

The stipulation is to remain in effect until pertinent legislation is enacted by Congress, but if no such action is taken by July 31, 1948, the stipulation will terminate 60 days later and in the meantime the parties will determine whether to continue or revise the agreement.

One paragraph states that the executive branch of the federal Government confirms its policy as to future legislation as described to the Supreme Court by the attorney general when the case was argued. This is that the Government will not seek damages for exploitation of the properties prior to the court's decision, will not destroy or confiscate honest or bona fide investment, and will establish equitable standards for continued operation of private establishments wherever consistent with the national interest. Until Congress acts, however, the stipulation reserves to the Government the right to make any claim it desires.

One of the three areas to which the Government renounces all claim is "that part of San Pedro Bay landward of a line drawn from Point Fermin in a northeasterly direction through a point 300 ft. due south of the southeasterly extension of the Navy mole and breakwater to the line of ordinary low tide in the city of Long Beach." All wells along the beach draining this area are not affected by the Supreme Court decision, but it will take a check of well logs to determine if any of them are so slanted as to enter the federal Government's property outside of this line. Similarly, other wells along the coast will have to be logged to determine whether or not they extend out beyond the low-tide mark.

It is stipulated that this line is approximate only and is not a surveyed line, and that it will not prevent California from claiming that a larger area of San Pedro Bay is inland waters. Nothing is settled as to the boundaries of other bays and harbors along the coast, and as to them both parties retain the right to make any claims they may desire. The Coast and Geodetic Survey has been asked to make surveys and findings regarding the boundaries of all bays and harbors and the low-tide mark at other points, but much litigation may be involved before these boundaries are finally settled. *(Comments on the tidelands stipulation may be found under Watching Washington, page 51.)*

States Plan Fight to Regain "Tidelands"

Officials in several states are making plans for an effort to regain control of the submerged coastal areas through legislation in the next Congress.

In Austin, Beauford Jester, Texas governor, studied the appointment of a state-wide committee to coordinate activities of various individuals and organizations seeking federal quitclaim legislation. Louisiana officials considered a meeting of representatives of several states to discuss the legislative campaign.

The Oil Conservation Board of Montana passed a resolution urging Congress to enact promptly appropriate legislation returning titles to the offshore lands to the states.

Nu-Enamel Oil Corp. Moves

Nu-Enamel Oil Corp., subsidiary of Nu-Enamel Corp., paint and paint products company, is being moved from Chicago to Dallas. Gerald Coffee and James Johnson will handle all operations of the subsidiary, including drilling, leasing, and the sale of all crude oil. Offices will be in the First National Bank Building Annex.

Preparations Going Forward for Silver Anniversary Oil Show

by Dahl M. Duff

PLANS are moving forward rapidly for the International Petroleum Exposition in Tulsa next May with cfficials confident attendance will reach the quarter-million mark during the Silver Anniversary show.

The 8-day exposition opening May 15 will be the first held since 1940. Many technical developments made in the industry since that time will be displayed, and keen interest is being shown in the forthcoming exposition both in United States and foreign areas.

The some 700 exhibitors in prospect include the top manufacturing and service companies in oil and related industries. To meet their needs, the exposition management is enlarging the grounds and adding display space and other facilities. Both exhibitors and the exposition are now at work repairing and redecorating the property.

Ample Accommodations

More than 2,000 rooms in Tulsa and surrounding area have been tabulated and listed by the housing committee in its preparations to assure ample accommodations for visitors. The housing committee was scheduled to open an office August 1 in the Wright Building in Tulsa to handle inquiries and continue its work.

The first postwar exposition is expected to attract several hundred visitors from foreign areas. The Nomads organization, with its chapters in New York, Dallas, Houston, Los Angeles, and Tulsa, is promoting this phase of the show.

Major alterations of the exposition grounds is under way as a result of the lease from the Tulsa County Fair Board of a 100-ft. strip of land along the north side of the area. This additional 85,000 sq. ft. brings the total grounds to 412,220 sq. ft., slightly more than 20 acres.

The additional area on the north will be separated from the remainder of the grounds by an as yet unnamed White Way. This will form a loop with the existing Skelly Drive on the east and Drake Drive on the west. These improvements involve an expenditure of some $50,000. The space on the north has already been taken by several manufacturers, including General Motors Corp. which is planning a permanent $50,000 building bringing its total investment to $200,000, according to exposition officials. Others to be in the area are Bethlehem Supply Co., George E. Failing Co., Brewster Co., Inc., and Dresser Industries, Inc.

At present work is about a third completed in the renovating and redecoration of the eight major exposition-owned buildings and the approximately 1,000 exhibitor booths. The color scheme, previously aluminum and green, is being changed to white and red; a $25,000 four-room hospital was slated to be finished this week and enlargement of the cafeteria's seating capacity by a third at a cost of $15,000 to $25,000 is to commence shortly.

Exposition officials are negotiating for the use of one of the regular Tulsa County Fair Building to display selected exhibits previously shown in the Scientific and Technical Building and portraying the industry's contribution to the advancement of science.

The record attendance and exhibits anticipated at the 1948 exposition will mark another step in the steady growth of the show since its inception in 1923 with 27 exhibitors and 14,000 paid attendance. At that time, the exhibits were valued at $10,000 to $20,000. In 1940, the exposition, called "America's largest industrial show," attracted 194,491 persons with the 628 exhibits costing at $15,000,000 to $20,000,000.

Nomads are assisting in publicizing the Silver Anniversary International Oil Exposition in foreign oil areas. Here are Frank J. Hinderliter, exposition vice president; Clyde H. Pape, treasurer; Charles W. Thornhill, chairman of the Nomads national board of regents; H. R. Powers, exposition secretary; and (seated) W. G. Skelly, exposition president

Aerial view of the International Petroleum Exposition grounds with the newly added north-side area to the left

Price Increase Only to Improve Production, Says Jersey Company

CLARIFYING its position in regard to price and supply, Standard Oil Co. of New Jersey in an official company statement July 24 said it is following the general policy of not increasing prices unless they tend to "maintain or bring out additional supplies."

The statement reasserted a policy first indicated June 19 by Eugene Holman, president of Standard Oil Co. (N. J.), in a speech at Bradford, Pa., in which he said he believed today's crude-oil prices under present conditions are adequate in a majority of cases.

The statement by the operating affiliate said the company feels that "further increases in the price of crude oil or products under present conditions are not in the best interests of either the oil industry or the public." A price increase, it said, usually results in added supplies to balance demand but this would not be the case today "where a shortage of fabricated steel and other materials limit the industry's ability to product, transport, and refine more crude oil." The company feels, the statement continued, "that such price increases would be only inflationary and should be restricted."

Standard of Jersey explained it believes its "hold the line" price policy has not worked a hardship on independent dealers and distributors handling Esso products. "We are continuing," the statement said, "to share our available supplies equitably with all our customers."

The company said it was issuing the statement in response to numerous inquiries. "The present demand for oil products is higher than ever before in history. The ability of the industry to meet this unprecedented demand is strained, not by lack of crude oil in the ground, but by limitations of transportation and other facilities occurring largely as a result of the war," it said.

John R. Steelman, assistant to the president, praised the company's announcement as a "patriotic action." From Washington he sent the following telegram to M. J. Rathbone, Standard of New Jersey, president:

"Since the wholesale commodity price index went to a new high last week, your announcement of a "hold the line" price policy for crude oil and products is a patriotic action that will be appreciated by all. Price increases at this time, unless absolutely unavoidable, are selfish and foolhardy. To hold down the price of oil is good for the country and good for business."

Offshore Leases Draw Record Bids

BATON ROUGE.—Record bids for offshore leases in the Gulf of Mexico were made here July 22 by major oil companies, despite the Supreme Court's recent decision giving rights to tidewater lands off the California coast to the federal Government.

The earlier announcement by Humble Oil & Refining Co. to discontinue all construction and preparations for drilling in the gulf until the question of title to the submerged lands is clarified by Congress, apparently had little effect on today's bidding.

Humble withdraw crews from two drilling platforms under construction and stopped work on a base of operations at Grand Isle, La., until it is settled by Congress that title to offshore lands being leased by the State of Louisiana to oil companies is vested in the state.

B. A. Hardey, Shreveport, chairman of the state mineral board, declared: "The board is pleased to note that there is apparently no lessening of interest in the tidelands areas. We're going to be in there fighting all the way to help the state retain title to its offshore lands. . . . If the court decisions go against us we'll carry the fight to Congress."

Marine leases on 109,655 acres today brought the state $1,395,913, an average of $12.74 an acre, an increase of $4.43 per acre at the last bidding. Other leases on 36,238 inland acres swelled the total to $1,737,678.

Largest bid submitted to date for gulf leases was $65 per acre, bid by Shell Oil Co., Inc., for two tracts totaling 7,230 acres adjacent to Bird Island off north Plaquemines Parish. Offshore leases in the bidding was concentrated in the Main Pass area where $960,278 was bid for 58,517 acres, and in the Chandeleur Sound area when 50,138 acres brought more than $435,635.

Hardey announced that a 60-day period between advertising of offshore leases and taking of bids will be in effect to allow completion of geophysical work without too much concentration. The action was taken to protect Louisiana's fish and shrimp industry, following complaints that dynamiting during seismograph operations resulted in large quantities of floating dead fish.

Stanolind Planning Brownsville Plant

STANOLIND OIL & GAS CO. is reported planning the construction of a $12,000,000 to $15,000,000 chemical plant at Brownsville, Tex., which will operate in conjunction with the Carthage Hydrocol synthesis plant now under construction.

While no comment on the reports was made by company officials, G. E. Dodd, president of the board of directors of the Brownsville Navigation district, said the Stanolind plant would utilize various byproducts from Carthage Hydrocol's operations. It was reported Stanolind's plant would occupy an 85-acre site adjoining Carthage Hydrocol's plant.

Carthage Hydrocol, at a cost of some $20,000,000, is preparing to construct at Brownsville the first commercial plant in the United States to convert natural gas into liquid hydrocarbons, including motor fuel. Stanolind also is making plans to erect another natural-gas conversion plant in Hugoton field in western Kansas with construction expected to start next year.

Clearing and grading of the site of the Carthage Hydrocol plant has been completed, and preparations for construction to start early in August are well under way. All major facilities are installed, including roads, power lines, water lines, railroad, etc. Start will be made on installing piling and foundations for the major units some time in August.

West Edmond Field Unit Plan Approved

Plans for unitization of West Edmond field were approved July 29 by the Oklahoma Corporation Commission in the first order issued under the state's pioneering 1945 unit operation law.

The order involves the 30,000-acre Hunton lime zone of the Central Oklahoma field and follows prolonged hearings on the application requiring 18 days and accumulating an estimated half million words of testimony.

Unit operation is expected to start in about a month. First step will be to shut in wells with high gas-oil ratio; second phase will be gas injection. These two operations are expected to increase ultimate recovery 50,000,000 to 190,000,000 bbl.

this week

REFINING—Stanolind reported planning construction of $12,000,000 to $15,000,000 chemical plant at Brownsville, Tex., to utilize byproducts from natural-gas synthesis plant to be constructed by Carthage Hydrocol. . . . ¶Shell announces refinery production record at Wood River, Ill., says its plants now producing well above wartime rates to meet current demand. . . . ¶WAA asks offers on $11,498,103 aviation-gasoline plant near Texas City operated during the war by Southport Petroleum Co. . . .

NATURAL GAS—Tennessee Gas Transmission and FPC reach agreement providing voluntary rate reduction of $856,000 annually and avoiding further commission proceedings and possible prolonged litigation. . . . ¶Department of Interior takes over rights to helium-bearing natural gas in Rattlesnake field, San Juan County, New Mexico, under terms of legislation approved by the president. . . . ¶Canadian reports say feasibility of natural-gas pipe line from Alberta to communities on British Columbia coast or to areas south of the International Boundary is now being studied. . . .

INTERNATIONAL—Dutch forces recapture Standard-Vacuum and Royal Dutch-Shell fields from Indonesians. American technicians fight fires set by natives. . . . ¶U. S. Navy prepares to receive five cargoes of some 500,000 bbl. monthly of Navy special fuel oil from Arabian American concession on Persian Gulf. . . . Creole's production rises sharply, totaling 591,997 bbl. daily in June, highest figure since March, company report shows. . . . ¶U. S. State Department details futile efforts to reach agreement with Russia over $1,000,000 of equipment belonging to Romano-Americana, Jersey subsidiary, which was removed in 1944 by the Soviet military. . . . .

TIDELANDS—Federal Government and California officials reach interim agreement governing operations of offshore areas pending final decree by Supreme Court and legislation by Congress. . . . Stipulation defines tentative federal-state boundary line in three California bays, including San Pedro. . . . Leaders in Gulf Coast and other states lay plans for drive in next Congress for legislation returning title to states. . . .

EXPLORATION—Texas Co. test in Jefferson Parish, Louisiana, becomes world's deepest producer following completion as gas-condensate well from perforations at 13,879-13,904 ft. . . . New record threatened by Humble well in Montgomery County, Texas. . . . Swabbing test of perforations being made at 14,300-34 ft. which, if successful, will set new depth record. . . . ¶New field indicated for Goliad County, Texas, by Sunray well, now at 7,734 ft. in the wilcox. . . . ¶Stanolind discovery 3 1/2 miles southeast of Kingsville in Kleberg County, Texas., completed with flowing potential of 95.6 bbl. 44°-gravity oil daily. . . . ¶New condensate pay found in Wilson field, Jim Wells County, Texas, by Magnolia. . . .

Imperial 5, fifth producer in the new Leduc field, 20 miles from Edmonton, capital of Alberta, which blew in while drilling plug at about 5,100 ft. Now on production, it is expected to produce in the manner of the first four, which, under restricted flow, are producing 168, 243, 157, and 178 bbl. daily respectively. Ten other wells are nearing completion in the field, and several more locations have been staked. The field is expected to outproduce Turner Valley field, previously Canada's major crude source. View above shows prairie country in which field is located

Government Study Sets 1950 Demand at 2,200,000,000 Bbl.

by H. B. McCoy

This statement, here slightly abridged, was made before the special national-resources subcommittee of the Senate committee on public lands during the subcommittee's recent investigation of the petroleum supply outlook. H. B. McCoy is director of the Office of Domestic Commerce, Department of Commerce. The projections of demand for refined products in 1950 which are given here provide an economic forecast made by analysts outside the industry

MY testimony with reference to the demand for refined petroleum products in 1950 is primarily a digest of a part of an exhaustive study recently completed in the Office of Domestic Commerce entitled, "United States Petroleum Refining—War and Postwar." Having undertaken and completed an analysis of domestic refining capacity, it seemed not only appropriate but desirable to prepare an additional section comparing current capacity to probable demands a few years hence.

The problem of measuring future petroleum demand was approached with full realization of the dangers inherent in forecasting and the knowledge that the bases of such outlooks frequently change before the time covered by the estimates is reached. . . .

In our report we employed the second alternative (analysis of individual products trends) which we believe is the more realistic one and checked ourselves by the first method (correlation of total demand with other economic data) where sufficient series of data were available. Following this procedure our analysts arrived at an estimated total demand for refined petroleum products in 1950 of 2,200,000,000 bbl. This estimated total is summarized by consuming groups in Table 1.

TABLE 1—SUMMARY OF DEMAND ESTIMATES FOR 1950
(Figures in 1,000,000 bbl.)

Product—	Total	Domestic	Exports
Motor gasoline	937	927	10
Aviation gasoline	35	32	3
Distillate fuel oil	364	349	15
Residual fuel oil	478	468	10
Kerosine	105	100	5
Lubricants	53	38	15
All other products	220	219	1
Total	2,191	2,133	59

It should be noted that motor gasoline comprises some 43 per cent of the total, constituting by far the most important single item. This demand of 937,000,000 bbl. is based on separate consumption outlooks for passenger cars, trucks, buses, tractors, military, and miscellaneous gasoline users. Almost two-thirds of this total —604,000,000 bbl.—will be consumed by passenger automobiles. This is predicated on the belief that there will be 34,500,000 cars in use in 1950, each consuming an average of 17.5 bbl. per year, or about the current rate of consumption.

The outlook for truck production of 960,000 units for domestic use annually over the next 3 years, with appropriate allowances for scrappage and increased usage of diesel fuel, indicates 7,200,000 trucks using gas in 1950. Average consumption of gasoline per truck in that year is placed at an average of 28 bbl. which would create a demand for 202,000,000 bbl. of gasoline.

The use of buses has grown rapidly and placing their number in 1950 at 135,000 is a conservative outlook. Appraising figures on gasoline consumption per bus contained in a special study of the Bureau of Public Roads in 1946 led us to put the average unit consumption in 1950 at 185 bbl. Commercial buses are thus expected to provide a demand for 25,000,000 bbl. of gasoline in that year.

Tractors in use were estimated at 3,200,000 in 1950. An analysis of tractor-fuel usage in past years resulted in an estimate of requirements of 49,000,000 bbl. of gasoline by farm tractors in 1950.

The military consumption of motor fuels was placed at the same level as the requirement for fiscal 1948 as released by the Army and Navy Petroleum Board May 28 of this year. This indicated consumption of 7,000,000 bbl. is used on the assumption that no war emergency will be faced prior to 1950 and that military strength will not be reduced below the level provided in the current fiscal year.

Miscellaneous gasoline demands in 1950 are placed at 50,000,000 bbl., approximately 10,000,000 of which will be for exports. Exports have fluctuated rather widely over the last 20 years reaching a peak in the war years. Foreign shipments in 1945 and 1946 totaled 88,000,000 and 45,000,000 bbl. respectively but these amounts are expected to decline sharply over the next several years, largely because of foreign demands being met in a greater degree by Middle East sources of supply.

The motor gasoline demand figures are summarized in Table 2.

TABLE 2—ESTIMATED TOTAL 1950 DEMAND FOR MOTOR GASOLINE

	Quantity (1,000,000 bbl.)	Per cent of total
Passenger cars	604	64.5
Trucks	202	21.6
Buses	25	2.7
Tractors	49	5.2
Military	7	0.7
Miscellaneous*	50	5.3
Total	937	100.0

*Includes 10,000,000 bbl. for export.

The estimate of 35,000,000 bbl. of aviation gasoline to be consumed in 1950 is derived almost entirely from the study "Civil Aviation in the National Economy" prepared last year by the Civil Aeronautics Administration.

Fuel Oil

Fuel-oil production has increased even more rapidly than gasoline output in the past 15 years. . . . The important point to note is the far greater relative gains recorded for distillate fuel oils as compared with residuals. It is anticipated that distillate fuel oils will further improve their relative position over the next several years.

Our estimates of distillate and residual fuel oil demand in 1950, by uses, are presented in Table 3.

TABLE 3—TOTAL FUEL-OIL DEMAND IN 1950
(Figures in 1,000,000 bbl.)

Use—	Total	Distillate	Residual
Heating oils	284	234	50
Railroads	115	25	90
Ships' bunkers	100	20	80
Gas, electric power plants	65	15	50
Smelters, mines & manufacturing	115	20	95
Oil company fuel	62	2	60
Military	51	13	38
Exports	25	15	10
All other	25	20	5
Total	842	364	478

Heating oils.—The figure for heating oils in 1950 is based on a careful analysis of the probable number of conversion oil burners and new units which will be sold between now and that year; also an appraisal of the approximate number of new homes to be built and which will be heated with oil; and finally an appraisal of the average consumption of fuel oil per burner. We have predicated our 1950 distillate-oil consumption of 234,000,000 bbl. on a probable 4,500,000 home burners in use in that year, consuming 47 bbl. each, plus a consumption of some 22,000,000 bbl. by space heaters using fuel oil.

The 50,000,000-bbl. consumption for residual heating oils is only a modest rise over 1945, the latest year for which actual consumption data are available.

Railroads. — Primarily because of the growth of diesel-powered locomotives, it is believed that the outlook for a consumption of 25,000,000 bbl. of distillate fuels by railroads is conservative. It is anticipated there will be a decline from the current use of residual oils by railroads to an approximate 90,000,000 bbl. in 1950.

Ships' bunkers.—All but a handful of United States vessels have been oil-powered for some years and by 1946 four-fifths of the world's merchant fleet tonnage was oil-powered as against one-fifth powered by coal. Not much increase in ships' use can be expected from increases in the proportion of oil-burning vessels. However, the United States fared better than most of the nations in war losses and also was the principal builder of new tonnage during the war. It is felt that by 1950 bunkering demand will have declined from the peak war levels but to a point still somewhat above that of the late thirties. We fell this demand will be supported by extended relief and rehabilitation needs abroad and by a larger volume of world trade. Here, too, the greater relative gain will be on the part of distillate fuel oils so that the net outlook is for the consumption by vessels of 20,000,000 bbl. of distillate and 80,000,000 bbl. of residual fuel oils in that year.

Gas, electric power plants. — The one major assumption on which our whole group of estimates is based, namely, a high level of employment and production, would result in an increased number of purchasers of the products and services of public utilities as well as an increased consumption by present users. Some expansion in the field, which was quite generally restricted during the war, is expected to place the aggregate consumption of fuel oils by utilities at 65,000,000 bbl. in 1950.

Smelters, mines, and manufacturing.—Despite the probability of rising prices for fuel oils, particularly residuals, which may retard the increased consumption by industry, it is felt that by 1950 the demand for both distillates and residuals will be at least 5 per cent higher than in 1945. A rise of this magnitude—to 115,000,000 bbl.—would be accounted for by normal production gains in a continued period of high-level employment.

Oil-company fuels.—Since refining operations were at near capacity levels in 1945 and 1946, not too much of an increase in oil-company usage can be foreseen for 1950 without a substantial increase in production and refining activity. A continued high level of business activity would, we believe, see the oil industries bending every effort to supply the necessary crude oil and making any needed additions to refining capacity. For this reason, oil-company needs for fuel oil in 1950 should total at least 62,000,000 bbl., an increase of only 4,000,000 bbl. over the actual consumption in 1945.

Military.—As in the case of military needs for motor gasoline in 1950, requirements for fuel oil are included in our estimates at the same levels of need indicated by the Army and Navy Petroleum Board for fiscal 1948, or 51,000,000 bbl.

Exports.—The weight of speculation by the majority of analysts is that United States export demands will be sharply reduced over the next several years with foreign needs being supplied from other sources than the United States. It is not believed that this changed relationship will be completely effected by 1950 so that our estimated 25,000,000 bbl. of exports in that year, while well below prewar levels, probably will decline further in subsequent years.

Other uses of fuel oil.—Expanding use of diesel power in trucks, construction equipment, farm machinery, buses, boats, and new uses which would fall under this heading should raise distillate fuel-oil consumption to 20,000,000 bbl. by 1950. This is roughly double the 1940 usage but only a moderate rise over the actual consumption attained in 1945. Competition from other more important users and a shift to distillate oils by miscellaneous consumers will probably hold residual consumption to 5,000,000 bbl.

Other Products

Kerosine and lubricating oil are the largest volume petroleum products other than gasoline and fuel oil. "All other products" includes a long list of additional items such as wax, coke, asphalt, road oil, still gas, and losses in refining operations.

Kerosine. — Despite the change within the petroleum industry from a kerosine to a gasoline economy, there are still quite substantial and growing volumes of kerosine consumed in this country. Domestic sales have risen steadily since the early thirties to 89,000,000 bbl. in 1946.

Continued modest growth of present uses indicate a domestic consumption of at least 100,000,000 bbl. of kerosine in 1950, plus 5,000,000 bbl. for export shipment.

Lubricants. — Outlook for the domestic consumption of 38,000,000 bbl. of lubricating oil in 1950 reflects a reasonable increase which might be expected with the increased number of cars, trucks, and planes and a high level of industrial activity, The expectation is tempered somewhat by offsetting factors of increased mechanical efficiency and improvement in the character and stability of lubricating oils.

Lubricating-oil capacity outside the United States is comparatively small and may or may not grow in the Middle East as those fields are developed. Historically American crude has furnished the best type of base stocks for processing lube oils although improved lubricant-refining facilities permit the use of some inferior base products. Exports of lubricants are, therefore, not expected to decline and should total about 15,000,000 bbl.

All other products. — Consumption of all other products in 1950 should approximate 220,000,000 bbl. Remaining products of the petroleum refining industry in the immediate prewar years constituted a fairly constant percentage of total demand and the ratio has been used to project this group to 1950. Various items included will experience varying growth with some, particularly asphalt, certain chemical products, and liquefied petroleum gas expected to show above-average gains.

The outlook for the major petroleum products are all for increases in demand, with residual fuel oil growing at a slower rate than other products. Residual fuel oil historically has been considered a byproduct of the petroleum industry and has traditionally sold below the price of crude inasmuch as its market price was influenced to a considerable extent by the prices of competitive fuels.

The new processes of catalytic cracking produce a larger proportion of gasoline and distillate fuel oil and relatively less residual fuel oil, than does thermal cracking. With the demand for gasoline and the middle distillates at the high level foreseen, and being the more profitable products as compared with residual fuel oil, it is expected that the refiner will tend to make these higher-profit products at the expense of residuals. It is expected that the demand for the more highly refined products will continue to show a gradual growth in relative importance with a beneficial effect on the price of residuals in so far as the petroleum industry is concerned.

I have given you our best outlook as to the demand for refined petroleum products as of today. The interplay of many economic demands over the next few years will determine its real validity.

Gulf Creates Fellowship

A fellowship to be granted a candidate for a master's degree in chemical engineering has been established at the University of Oklahoma by Gulf Oil Corp. The fellowship provides $1,000 for the academic year beginning September 1.

International

WORLD-WIDE OIL DEVELOPMENTS

Efforts to Settle Romanian Claim With Russia Told by U. S.

REPEATED efforts of the American Government over a period of nearly 2 years to obtain Russian recognition of the American ownership of some 7,000 tons of oil equipment removed from Romanian were detailed in a recent announcement of the Department of State in Washington.

The attempts to reach a settlement on the question of the equipment were made in nine meetings of the joint United States-Soviet Oil Commission. The State Department's announcement said the American Embassy in Moscow is protesting the failure of the commission to reach an agreement on the equipment *(The Oil and Gas Journal, July 26, page 159)*. At the same time the department disclosed American participation in the commission has been concluded "after it became obvious that there was no hope of securing any cooperation from the Soviet members in carrying out the commission's responsibilities."

The equipment involved belonged to Romano-Americana, a Standard Oil Co. (N. J.) subsidiary, and was taken by Soviet military forces during the early days of their occupation of the country in the latter part of 1944. The State Department recounted the question was discussed at the Potsdam Conference and that it was decided to set up the commission to investigate to arrive at a basis for settlement.

Nine meetings of the commission were held, beginning with the first August 20, 1945, the announcement continued. The Soviet members took the position the burden of proof rested with the American delegates, and at the second meeting, the Russian group was furnished data showing American ownership and quantity. The equipment, the department said, was valued at $1,000,000 by the company.

The Russians then asked for exhaustive data on all equipment acquired by the company between January 1, 1942, and October 1, 1944, together with quantity, sources, shipping routes, methods of payment, and value. The American members declared this information irrelevant and renewed their requests for Soviet data on the equipment involved in the removals.

"The commission met again January 22 and February 15, 1946, without making any progress despite repeated efforts of the United States side to obtain from the Soviet side either (1) evidence disproving the quantity and American ownership of materials removed or (2) definitions distinguishing between American and German-owned materials," the statement said.

Russians Delay Reply

An eighth meeting was held October 8, 1946, at which the American members presented extensive data requested earlier, and although a prompt study was promised, nothing was heard from the Russians until June of this year. At that time, the Russians took the position the Americans must prove all equipment held by the company between 1942 and 1944 was American property before the Russian side would produce any information of their own. "Feeling that the continued existence of the commission would serve no useful purpose, the American members in accordance with instructions from their government, announced that they would consider the commission terminated . . .," the department said.

Failure to reach a settlement over the Romana-Americana's property was expected to react further against Russia in its effort to obtain some $18,000,000 in blocked postlend-lease equipment, much of it intended for the Soviet oil industry. Congress halted further shipments of lend-lease equipment to Russia because of Russia's delay in settling its $11,000,000,000 wartime account.

Technicians Battle Fires In Sumatra Oil Fields

American technicians early this week were battling fires in the Socony-Vacuum oil fields of southern Sumatra, believed set by Indonesian patriots.

The fields were captured by the Dutch army last week. The fires were believed set by infiltrating members of the Republican forces. Observers said seven oil-storage tanks were afire or burned out in the field at Pendopo, 60 miles southeast of Palembang, but that none of the wells had been fired.

The Royal Dutch Shell fields at Talang Djimar were captured shortly after the Socony-Vacuum fields were recovered.

Mexico Halts All Imports Of Nonessential Gasoline

A presidential decree has gone into effect in Mexico halting all nonessential imports of gasoline from the United States.

Under the decree gasoline imports will be allowed "only when they are necessary to satisfy the specific region to which they are destined." The secretary of national economy will determine which imports will be admitted.

Shipments en route to Mexico will be allowed to cross the border, provided that they were contracted before July 25.

Hungary to Levy Special Tax to Spur Production

A special tax will be levied on Hungarian American Oil Co. profits in excess of 8 per cent, by Hungarian government officials, according to reports from Budapest.

The tax, to recover an estimated $15,000,000 will provide funds to promote more intensive production of oil required for reparations and to fulfill provisions of a recent Soviet-Hungarian agreement whereby oil deliveries to Russia would be increased.

Creole's June Output Highest Since March

VENEZUELAN crude-oil production of Creole Petroleum Corp. climbed back to 591,997 bbl. daily in June, the highest since the March daily average of 594,544 bbl. Of the June production, 443,989 came from Lake Maracaibo area and Cumarebo and the remaining 148,008 bbl. from Eastern Venezuela. May production averaged 555,393 bbl. daily.

Total crude oil refined was also up in June to 66,818 bbl. daily compared with 59,538 bbl. daily in May.

Twenty-two development wells were brought in as oil producers. The fields where these wells are located, their average initial production and depth are: Bolivar Coastal (B.C.F.), nine, 840 bbl., 4,198 ft.; Quiriquire, five, 512 bbl., 4,045 ft.; Jusepin, three, 376 bbl., 4,161 ft.; Mulata, three, 319 bbl., 5,241 ft.; Cumarbo, one, 307 bbl., 1,898 ft.; and San Joaquin, one, 1,073 bbl., 7,030 ft.

Of the company's six wildcats, three were oil producers and three dry holes. The fields, average production and depth follow: Jusepin area, one oil well and one dry hole, 290 bbl., 5,121 ft.; Mulata, one oil well and one dry hole, 150 bbl., 7,946 ft.; Tucupita, one oil well, 900 bbl., 5,824 ft.; and Guarico area, one dry hole, 5,233 ft. The dry hole in the Jusepin area was well JX-3.

Mata Grande Production In Venezuela Extended

An extension of the proved area of the Mata Grande concession of Phillips Venezuelan Oil Co., subsidiary of Phillips Petroleum Co., is indicated by current tests on a well in the Eastern Venezuela field.

Phillips officials said the initial 24-hour test of its No. 16 well produced 300 bbl. of 33°-gravity oil through a 7/32-in. choke with a gas-oil ratio of 400 to 1. Production was from 4,760 ft.

Ten oil wells and one gas well now are producing on the Mata Grande concession, where the company drilled its first well in 1945.

Phillips has disclosed it recently terminated its lease on 294,000 acres of Simiti lands in Colombia as a result of geological and geophysical field studies.

Arabia Planning Internal Development Program

NEW YORK.—With added royalties from increasing oil production, Saudi Arabia is expecting to spend some $270,000,000 during the next 4 years, according to reports from the Middle East area.

King Inb Saud of Saudi Arabia will be receiving about $50,000,000 annually from oil royalties by the early 1950's, according to Fuad Bey Hamza, Arabian development minister. Arabian American Oil Co. is lending the King $40,000,000 for construction of a port at Dammam and for the proposed railway from Dammam to the capitol at Riyadh, the loan to be repaid from royalties.

James T. Duce, Arabian American vice president, told a Senate subcommittee in Washington recently the company will be able to deliver 700,000 bbl. daily on the Mediterranean and Persian Gulf coasts with completion in 1949 of the Trans-Arabian pipe line and other facilities.

Anglo-Iranian Production Shows Sharp Increase

Iranian crude-oil production for April totaled 1,605,000 tons (411,933 bbl. daily) compared with the March output of 1,430,000 tons (355,193 bbl. daily), according to figures released by Anglo-Iranian Oil Co., Ltd., the only oil-producing company in Iran.

Total production for the first 4 months of this year was 6,053,000 tons (388,400 bbl. daily), compared with 6,527,000 tons (418,815 bbl. daily).

Navy to Take Five Cargoes Monthly From Persian Gulf

NEW YORK.—The U. S. Navy is making preparations to receive five cargoes of Persian Gulf oil a month which are being shipped to the East Coast to build up the Navy's low stocks.

The Navy is paying $1.05 per barrel to Arabian American Oil Co. Persian Gulf oil brought to the United States by the end of December for the Navy's account will reach 3,000,000 bbl., to be stored at Norfolk, Va., and Melville, R. I.

New Trinidad Asphalt Plant Being Built

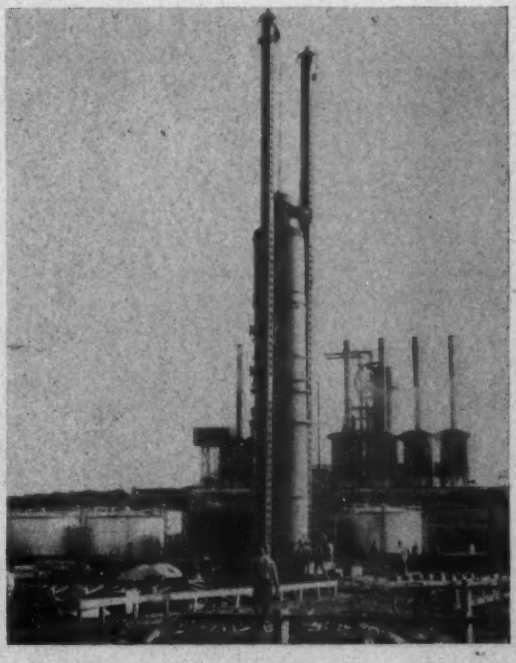
THE first of two new asphalt plants to be built by United British Oilfields of Trinidad, Ltd., at Point Fortin, Trinidad, already is well under construction. The two units will cost in excess of $500,000.

The plant already being built, planned for completion and operation in 1948, is a modern, high-vacuum plant designed to produce asphalt under comparatively low-temperature conditions to avoid cracking.

The second will be a continuous blowing plant and will be one of the few of its kind in the world. It is designed to take the asphalt produced from the high vacuum plant and modify its properties by an air blowing, or oxidation, process. The process is expected to increase the number of asphaltic materials which can be produced.

Combined capacity of the two plants will be 275 tons of finished asphalt daily. They will be located near U.B.O.T.'s Point Fortin refinery, completed a few years ago.

The two units will be integrated with an existing topping unit and will replace the bitumen-making section of this plant.



Vacuum column being installed in the first of two new asphalt plants of United British Oilfields of Trinidad, Ltd., near the company's refinery at Point Fortin, Trinidad. Construction has not yet begun on the second of the two plants, which will have a combined capacity of 275 tons daily. Plant above is scheduled to be in production in 1948

Land along Lagunillas producing sector of Lake Maracaibo has gradually "subsided" 9½ ft. It is now protected by this coastal dike

Maracaibo and Adjoining Areas World's Largest Producing, Refining Concentration

Up right at the top for volume rates in production, refining, and transportation—for one concentration of activities—is the famed Lake Maracaibo area. In this article the Journal's engineering editor gives the over-all picture as prepared from his "on location" data.

by Kenneth B. Barnes

International

WORLD-WIDE OIL DEVELOPMENTS

Western Venezuelan oil fields and important wildcats drilling or completed

DON'T use a concept of the Lake Maracaibo, western Venezuela area, as merely consisting of some 30-year-old heavy-gravity oil fields, with wells scattered along the water edge, some a bit offshore. Such a notion is probably common to many who have not visited the region. While that type of description is a part of the facts, it is essentially inaccurate because the true scope and scale of the tremendous operations are not properly conveyed.

Actually, today, the Maracaibo region is one of the greatest producing, and refining (if the nearby Netherlands West Indies plants are included) concentrations in existence. To some extent the size might be grasped if one gathered and correlated all the various statistics and related and comparative data. However, the Maracaibo-region operations become really impressive when viewed on the spot.

First on the list are the famed "lake" fields. In the area these commonly are called Bolivar "Coastal" to differentiate them from the other fields scattered inland westward from the lake. The Bolivar Coastal or lake fields, from north to south, are Cabinas, Ambrosio, La Rosa, Punta Benitez, Tia Juana, Lagunillas, Pueblo Viejo, and Bachaquero. The northern ones are virtually one pool, the southern ones lie immediately adjacent to each other, so the entire list, stretching out along the shore for approximately 50 miles, can be designated in effect as one huge field.

The production rate of 609,000 bbl.

per day achieved a few months ago easily puts the field in first place as the world's largest, on the basis of production rate. This is 180 per cent of the current production from the East Texas field, the only other that begins to approach it in rate. Lake Maracaibo each day produces more oil than all of the fields in the Texas Gulf Coast (490,000 bbl)—or all of the West Texas fields (597,000 bbl.)—nearly twice as much as all of the United States fields east of the Mississippi River (425,000 bbl.)—and more than three times as much as all fields in the Rocky Mountain area (182,000 bbl.).

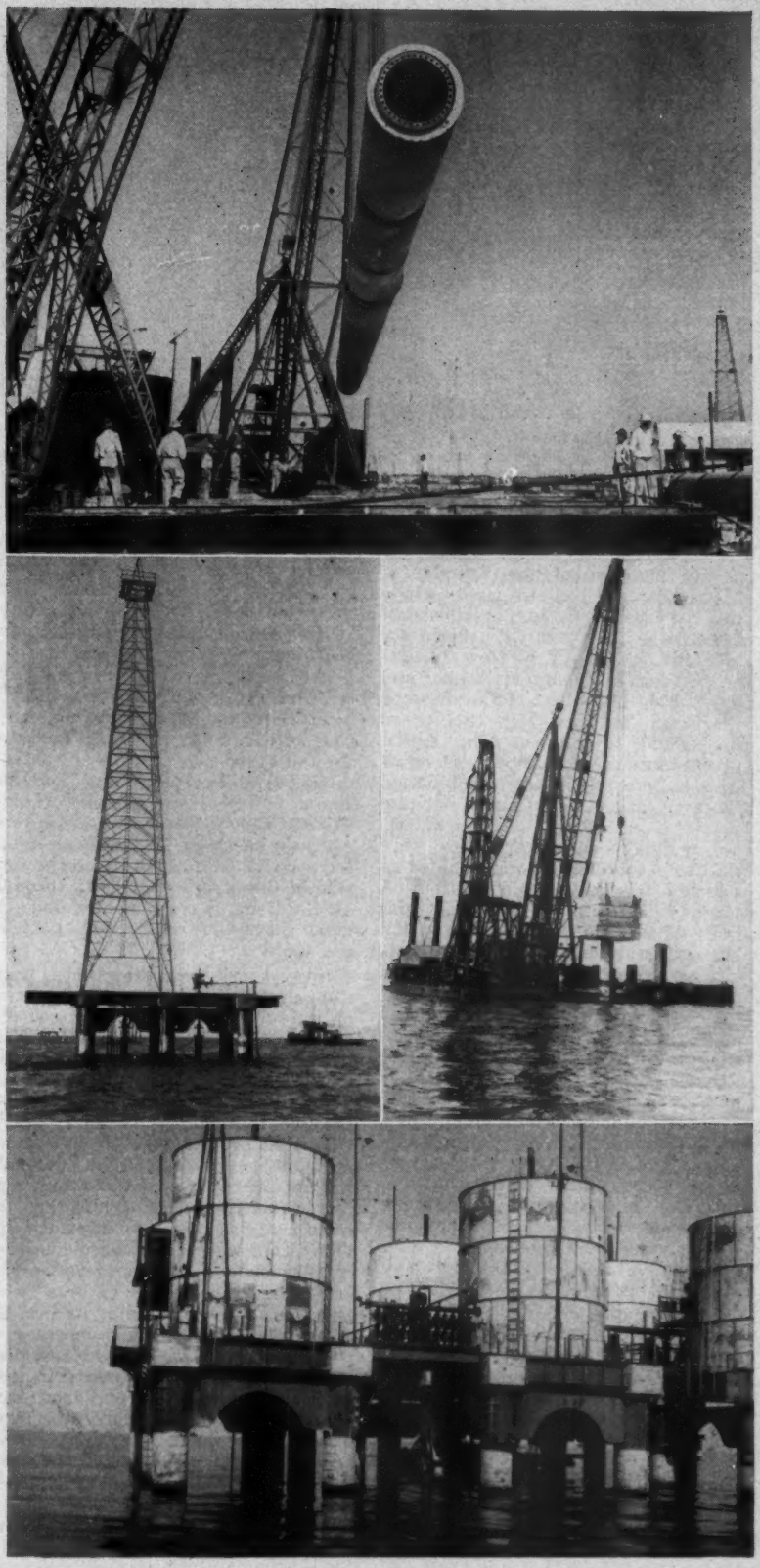
The large flow of Lake Maracaibo oil, as a matter of fact, furnishes the main feed of crude and products supply to many of the South and Central American countries and Europe. While this flow of crude oil from one field comes from only 3,092 wells and represents the comparatively high individual well rate of 197 bb. per day per well, the production is taken under very modern petroleum-engineering methods and practices.

Details of Maracaibo Area

Lake Maracaibo is shaped like a pear, with the stem pointing north and connecting to the Gulf of Venezuela. This body of water in turn opens out west of Paraguana Peninsula into the Caribbean. The lake water is fresh to brackish in character (1,485 p.p.m.), 115 miles in length, and 75 miles in width. Maximum depth reaches 113 ft.

West of Lake Maracaibo to the northeast and southwest are a dozen other pools. There is much interest in the present exploration and development of this territory, a contributing factor being bringing in new reserves in Cretaceous limestones. For example, Mara (1945) with three producing wells hit 20,000 bbl. daily at the close of last year.. At La Paz, seven Cretaceous wells added to the rest of the old shallow Eocene production there boosted the potential up to around 60,000 bbl. daily.

In the refining picture in western Venezuela, Creole Petroleum Corp. has started work on a new refinery at Amuay Bay which will have a capacity of some 70,000 bbl. per day, and the Shell group on a refinery of 40,000-bbl. capacity at Punta Cardon. These locations are on Paraguana Peninsula. The plants each will be complete in makeup, and total cost for the two will exceed 100 million dollars. Creole already operates a 12,000-bbl. tube still-fractionator skimming-type refinery at Las Salinas, in the middle of the lake fields, and Shell a 38,000-bbl. refinery at



Creole Petroleum Corp. produces about 400,000 bbl. per day at Lake Maracaibo, all from over-water oil wells. Specialized engineering and construction has made possible the recovery—to date only—of 1¼ billion barrels of oil from approximately 1,250 "lake" wells. These are representative views of the spectacular operations. The flow station or tank battery shown (one of several) is equipped for efficient individual well testing, is electrified, and can handle up to 55,000 bbl. per day

Construction work at Shell's big refinery going up at Punta Cardon, Paraguana Peninsula, Gulf of Venezuela

San Lorenzo, farther south along the east shore of the lake.

Any mention of the refining of Maracaibo crude oil also must include the 350,000-bbl.-per-day refinery of Lago Oil & Transport Co. (subsidiary of Standard Oil Co. of New Jersey) on the nearby island of Aruba, and the 250,000-bbl. plant of Curacaosche Petroleum Indistrie Mij. (Shell) on the island of Curacao. The Aruba plant contains a number of atmospheric, rerun, and combination cracking units, individually ranging in size from 10,000 to over 25,000-bbl.-per-day capacity. These are skillfully coordinated and coupled to schedule the large-volume output. A large fluid catalytic cracking unit built during the war, polymerization units, treating and sweetening installations, two modern alkylation plants, an isobutane isomerization unit, sulfuric acid manufacturing plant, and approximately 25,000,000 bbl. of steel storage are some of the major items. Electric power to the extent of 45,000 kw. and a large water plant for the evaporation of sea water for processing and domestic needs are operated along with a modern city for employes. The Shell installations at Curacao, in the way of refining equipment, offices, and housing, similarly are very extensive.

Specially designed shallow-draft lake tankers shuttle the Maracaibo crude on virtually a continuous stream to the two refineries, and in turn the output, with no more than a bare stop for processing, is sent out thousands of miles away to many points of consumption in South America, Europe, and elsewhere.

Location of Concessions

Of interest is the geographical location and operating points for the three major oil producers in the Lake Maracaibo fields. The city of Maracaibo, 135,582 population, is the port lying on the west bank of the neck connecting Lake Maracaibo and the Gulf of Venezuela. Here Creole Petroleum Corp. (Standard of New Jersey affiliate), Mene Grande Oil Co. (50 per cent Gulf, one quarter each International Petroleum Corp. and Shell) Caribbean Petroleum Co. and Venezuelan Oil Concessions, Ltd. (Shell affiliates) maintain large division offices and camps, as they might be called.

The Shell quarters are within the city itself together with large Caribbean Hotel maintained by company. The offices and personnel facilities for the other two concerns lie 2 to 3 miles out of Maracaibo, near the lake shore. Travel from the city to the Bolivar Coastal fields is via passage over the neck of the lake on large ferry boats. Disembarking on the east side of the lake, travel south through all the fields is conveniently done on good black-top roads that parallel the shore.

Interspersed every few miles from Cabimas on the north to Bachaquero on the south are the big camps of the oil concerns. These are sizable cities in themselves, complete with all types of warehouses, machine shops, marine and lake-tanker loading equipment, through to modern housing and recreational provisions such as swimming pools, bowling alleys, baseball fields, golf courses, outdoor moving-picture pavilions, etc. While the climate is classified as tropical, the many conveniences, modern housing, and personnel divisions make the Lake Maracaibo producing area compare very favorable with the best in virtualy any oil field anywhere.

Development of Lake Maracaibo field has been under three principal concessions. Properties of Venezuelan Oil Concessions, Ltd., cover the land areas making up the east shore of the lake, and this concern's producing facilities extend on a broad sweep from top to lower end of the total area of the fields.. Also, Caribbean Petroleum Corp. (another member of the Shell group) activities include production at its Mene Grande pool (35,000 bbl. per day), located inland about 20 miles southwest from the south end of Lake Maracaibo.

Concessions of Mene Grande Oil Co. consist of a strip of long, narrow, rectangular blocks lying immediately offshore and extending approximately 1 km. into the shallow waters of the lake. These rectangular blocks string along the whole length of the lake producing area.

Creole's concession holdings, in the majority, extend through the remainder of the lake's area under water with the exception of certain tracts now held by V.O.C.

Each company has tailored its own development and producing practices to care for the radically different situations found in each case. On shore, of course, are found the more conventional procedures. The Mene Grande blocks are located in comparatively shallow waters, so their wells are drilled and producing operations performed on pilings. Creole's drilling and producing, however, are scattered along a broad front out in Lake waters, to points nearly 10 miles from shore, and in depths up to approximately 100 ft.. These, therefore, are true marine operations and in their entirety constitute one of the most spectacular engineering feats to be found. The concern operates more than 125 powered marine units and 75 towed units, including personnel boats; service launches; material carriers; towing units, oil, mud, and cement barges; pipe-laying barges; pile drivers; and dredges.

The story back of the huge caissons, built up of a thickness of 4½ in.-1:2:3½ concrete mix, bound on ¼-in. inside steel cylinders, is a story in itself. .Outside diameter of the caissons is 5 ft. and they are made in lengths up to 156 ft. Total weight of one is as much as 84 tons. The caissons are floated to the locations where they are raised in position and arranged and steel bound in groups of four or six for drilling and oil tankage support purposes, all through very carefully designed engineering techniques laid out on a mass-production basis.

Another unusual feature of the lake fields is that the producing and transportation equipment approaches what is probably the highest degree of electrification in the oil business. The wells are pumped electrically. The flow stations (tank batteries) have electrically driven centrifugal pumps boosting the oil into the tank farms along the shore. And the trunk pipe lines and tanker-loading pumps are all electric. V.O.C., Mene Grande, and Creole each have large central generating plants, with individual capacities of 10,000 to 24,000 kw. daily. Numerous electrical facilities and high lines traverse both the shore area and out over the water to group points for transformer settings and to branches to individual locations.

Shown here with its crew is the custom-built DC-4 used by Arabian American Oil Co. to transport personnel between Dhahran, Saudi Arabia, and the United States. The crew captain is Donald A. Baldwin, center, front

Record Use of Aircraft Features Arabian American Operations

PLANS have been completed which will assure that operations of Arabian American Oil Co. and Trans-Arabian Pipe Line Co. will be carried on with the largest application of aviation transportation in the history of the petroleum industry.

Activities of the Arabian American company at present consists of a production of approximately 250,000 bbl. daily in three fields in Saudi Arabia with headquarters at Dhahran near the Persian Gulf and a refinery 40 miles north of Dhahran at Ras Tanura. This refinery at present is processing 110,000 bbl. of crude oil daily. Most of the remainder of the Arabian American company's crude oil is transported by pipe line to the neighboring island of Bahrein where a 135,000-bbl. daily refinery is in operation by Bahrein Petroleum Co., Ltd. Offshore shipments of Saudi Arabian crude oil also are made.

Owing to the nature of terrain, the type of operation, and the manpower situation, the Arabian American company future plans lend themselves to maximum use of aviation transportation. The company, under the direction of A. M. Martin who is vice president in charge of refining, has established an aviation department which in facilities probably has no duplicate within the oil industry.

Use With Trans-Arabian Line

The company also will have charge of and supply all aviation facilities that will be used on an extensive scale in the laying of the 30 and 31-in. pipe line from Dhahran to the eastern Mediterranean by the Trans-Arabian company. Laying of this line is scheduled to start before the end of the year. The program for the line calls for a landing strip at each pipeline station and the principal camps. While pipe-line and other heavy machinery will be taken to the right-of-way by truck and tractor, the various types of planes owned by Arabian American will be used to transport personnel along the line, and regular service will be available when the line is in operation. It is anticipated that part of the supplies for the permanent personnel at stations will be transported by planes specially designed for that purpose.

The need for airplanes arises from the long distances that will be involved in the extensive production, transportation, and refining operation, the climate, and the fact that Saudi Arabia is largely a desert area. Because of the dunes and constantly shifting sands, a permanent highway system over a large part of the operating area is not practical.

The Arabian American and Trans-Arabian companies in addition to the thousands of nationals of Saudi Arabia will employ a large number of people from adjoining countries. This includes skilled and semiskilled employes from Aden, Eritrea, and Sudan which are 1,000 miles from the oil operating centers of Saudi Arabia. Airplanes will be used to transport these people in a few hours to their destination which otherwise would require days and weeks by water or overland transportation.

Advantages of Air Travel

Single-engine planes are required for the short distances. For example, single-engine planes are used between the refinery camp at Ras Tanura and Dhahran, the general headquarters. The air distance of 28 miles can be spanned in less than ½ hour while the motor trip through the sand dunes requires a couple of hours. The same situation exists between Dhahran and Abqaiq, the principal field. During the extended summer period temperatures climb to as high as 120° F., a condition which also adds to the attractiveness of air travel. It is estimated that the production, refining, and pipe-line operations will require 3,000,000 passenger air miles per month.

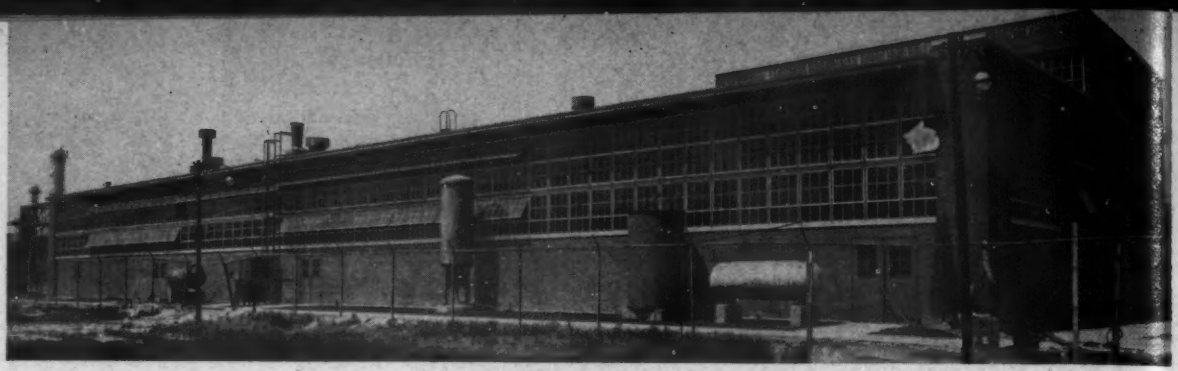
The fleet of Arabian American airplanes used in the field at present consists of: one four-engine C-54; 10 twin-engine C-47's; one twin-engine Beechcraft, and a number of single-engine all-metal planes. All these planes were converted for field flying and have varying uses. About 200 personnel are required to operate and maintain the aircraft.

This fleet is operated in accordance with CAA regulations of the United States and subject to regular inspection by that organization. All crew members are licensed by CAA, and operation and maintenance facilities are in accordance with accepted practices in the United States.

Transatlantic Plane

The Arabian American company recently placed its own airplane in service between the United States and Dhahran. This plane supplements the company's use of commercial airplane services between the United States and the Middle East of which it is by far the largest customer. The plane is a custom built DC-4 whose passenger accommodations were specially arranged to meet the needs of the company. In addition to a seating capacity for 20 passengers, the plane has stateroom sleeping accommodations for several passengers. It also has complete kitchen service.

This plane, shown with its crew in the accompanying picture, has completed seven round trips from New York to Dhahran. About 36 hours' flying time is required between the two points. In a typical flight the plane leaves New York at noon and flies to Lisbon, via Gander, Newfoundland, arriving at Libson 10 a.m., or 5 a.m. New York time. The crew and passengers stay at Lisbon that day and night and fly directly to Dhahran with a short stop at Cairo, Egypt. About 18 hours' flying time is required between Lisbon and Dhahran. There are alternate routes if weather conditions are unfavorable.



New lubricating-oil pilot plant of Socony-Vacuum Oil Co., Inc., going into operation recently at company's laboratories in Paulsboro, N. J.

Engineers, Editors Inspect Socony's New Lube-Oil Pilot Plant

by Arch L. Foster

PAULSBORO, N. J. — Representatives of the oil press throughout the country along with a large number of engineers and chemists inspected the new 200-gal.-per-day lubricating-oil refining pilot plant here July 29. This plant is just being completed and is the largest of its kind in the world, Socony-Vacuum executives say.

The plant brings under one roof all the many refining operations required to make finished modern lubricating oils. The building is 78 ft. wide, 228 ft. long, and 30 ft. high. In connection with it is a tank farm containing 24 tanks of capacities of 500 to 15,000 gal., required for storing crude and intermediate fractions and finished products. Because of its relatively large capacity the plant will permit manufacture of finished oils in quantities large enough to enable the company's engineers to carry out realistic field and road tests on the experimental products.

Three Continuous Treating Units

The system includes three continuous treating units, sulfuric acid, a single solvent extraction unit and a Duo-Sol or double solvent extraction unit. In addition a refrigeration unit with capacity equal to freezing 18 tons of ice per hour is provided for use in dewaxing oils. In addition five batch stills, of capacities ranging from 50 to 600 gal., are provided for distilling crude or fractions as desired. Nine steam stills are installed, to remove solvents from treated oil fractions. The single-solvent unit is so designed that any solvent can be used in it, such as phenol, cresylic acid, furfural, nitrobenzene, chlorex, etc. The Duo-Sol unit has nine stages and any number of these may be used or eliminated from the system, as may be wished. Continuous clay filters for finishing treated oils are installed. A unit for removing asphaltic constituents from crude oils will be installed later, to further the study of crudes and their specific properties.

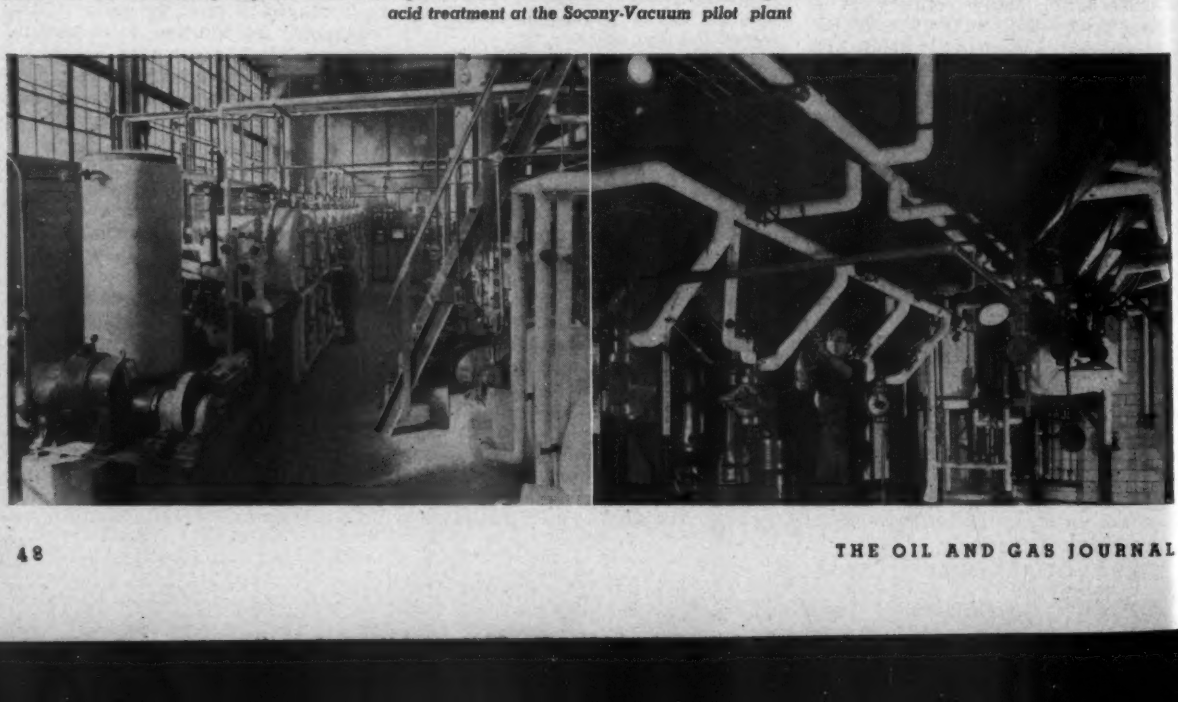
The laboratory is directed by Thomas P. Simpson, director of research and development laboratories at Paulsboro; Dr. A. A. O'Kelly is associate director; George H. S. Snyder is assistant director; R. Rea Jackson, manager; T. A. Petry, assistant supervisor, and Harold C. Myers, of the lubricating-oil division.

Texas Under Allowable For Five Month Period

Texas oil production was 7.75 per cent under allowables for the first 5 months of 1947, according to a report by the Texas Railroad Commission.

Allowables of 345,717,425 bbl. were set by the commission for the period, and 318,147,189 bbl. were produced. May, the latest reported month, indicated a downward trend with 8.87 per cent or 6,705,339 bbl. underproduction.

Left: Two separate purification processes are performed simultaneously as the lubricating-oil charging stock passes through the Duo-Sol unit at the new laboratory. Right: Bottom of receptacle from which theunwanted lubricating-oil constituents are removed during sulfuric-acid treatment at the Socony-Vacuum pilot plant



WASHINGTON WATCHING

BY HENRY D. RALPH

Export Bill Shelved

WASHINGTON.—A proposal to impose drastic restrictions on the export of petroleum products was defeated in the Senate during the closing hours of the session on the ground that the new export control law contains ample safeguards to protect domestic interests.

The bill slid through the House without debate, after being the subject of lengthy hearings by the merchant marine committee and was immediately reported by the Senate commerce committee, along with a similar bill sponsored by Sen. Homer Capehart of Indiana. When it was called up on the calendar, Capehart defended it on the ground that export of oil to Russia is inconsistent with the program to stop the spread of Communism in Europe. Senate leaders, however, contended that this argument is not pertinent, that the bill affects the broader subject of international trade with all countries, that exports have no bearing on the current shortage in Indiana, and that general law provides adequate control over petroleum exports. The measure was shelved without a vote but remains on the calendar until next session.

The bill would prohibit the exportation to any country of any gasoline, diesel oil, bunker oil, or lubricating oil unless the secretary of commerce certified in writing that such movement would not impair the national defense, endanger the national security, nor impair the civilian use of these products. Under the Second Decontrol Act, which became effective July 16, the secretary of Commerce is now requiring export licenses for foreign shipments of petroleum products and other commodities, and is required to consider domestic supplies and needs as well as the urgency of foreign requests. In practice, no export licenses are required for shipments to Canada, and other exports are based on country quotas and individual license applications.

"Tideland" Stipulation

THE tidelands stipulations between the federal Government and California provide a practical temporary working agreement but they settle nothing except the minimum boundaries of the three largest bays, only one of which, San Pedro, has any oil production.

Oil companies producing from the coastal waters are not parties, since legally the dispute is only between California and the U. S. Government, but the representatives of many of them were present in Washington during the negotiations. It took the two parties an entire month to agree on an apparently simple set of stipulations, indicating that every word and comma must have been subjected to prolonged scrutiny and argument.

Neither side gives up anything, and all issues can be fought out in the courts or in Congress. The only thing definite is that oil production will continue from existing wells for at least a year, but there will be no new leases or drilling except for offsets, and these must be approved by the federal Government.

The state will go ahead with its petition to have the Supreme Court reconsider its decision which awarded the marginal sea to the federal Government. By September 15 both parties must submit to the court their suggestions for a form of a decree to put the decision into effect. Unless they can agree on all points—which seems quite unlikely—the court may have to appoint a special master to determine the facts regarding boundaries of bays and harbors, and other matters in dispute, and this process could take months or years.

In any event, the Justice and Interior departments plan to submit a draft of legislation to Congress in January, because only Congress can determine many of the problems and issues. This will start a royal battle and will undoubtedly bring forth a counterproposal to undo the entire Supreme Court decision by giving all the marginal sea back to the states.

Difficult Legislative Task Seen

The joint press release of the Justice and Interior departments announcing the stipulation admitted that there are a "variety of complex problems" involved, and by the time Congress starts to work on legislation their variety and complexity will be even more apparent. The Justice Department says it wants to be fair and equitable with private investments in oil, piers, fisheries, and other developments, to protect the state and its subdivisions in their revenues from developed areas, and also to protect the national interest. In view of the fact that some people in Congress and out have been calling the previous situation an "oil grab" and have been insisting that the national interest requires federal control—if not plugging—of all coastal oil wells, it would seem to be difficult to draft legislation which will meet all objectives of the attorney general's announced policy.

The Government's Ocean

NO move against the tidelands oil operations of other states is anticipated from the Justice Department until some of the California problems become more nearly settled. However, when Congress tackles the problem it probably will legislate as to the entire marginal sea off all coastal states instead of confining itself to California.

Official Washington has taken due notice of the recent action of Humble Oil & Refining Co. in suspending drilling operations off the Louisiana coast pending clarification of the situation. If other companies stop offshore operations at a time when the need for more oil is acute it may cause a demand for early and positive action.

There is nothing in the California stipulation to give any comfort to offshore operators. The Government reserves the right to treat all such as trespassers, both before and after the date of the Supreme Court decision. As to operations since June 23 the Government limits itself to the recovery of only the net profits of the operators, which is the usual legal rule as to damages for unwitting trespass. But as to Texas and Louisiana operators the Government could, in theory at least, try to collect punitive damages for intentional trespass on the "Government's ocean" since the Supreme Court apparently said that no state has the right to lease out its coastal waters.

The press release explaining that the Government renounces all claim to three California bays admitted to be inland waters contains this sentence: "It is explained also that such a declaration will assure other coastal states whose problems are comparable to those in California." This probably is in the hope of calming down the attorneys general of other states, 46 of whom supported California, particularly the inland states who professed to be concerned to their title to the beds of rivers and lakes.

The administration is going to have a battle in Congress, whatever the form of the tidelands legislation it presents, and this statement may remove some of the opposition from legislators from inland states. But the California stipulation will not fully appease many of the coastal states. It does make it plain that clearly defined and largely land-locked bays

are not involved, but leaves undecided the fate of estuaries, coastal indentations, man-made harbors, fisheries, and piers not in natural bays.

New Leasing Legislation

THE "acquired lands" bill squeezed through Congress during the adjournment rush, after a couple of narrow squeeks, and is now before the president for signature. It permits the Interior Department to lease for oil, gas, and mineral development, under the general leasing laws applicable to the public domain, some 150,000,000 acres of land in the United States and Alaska acquired by the federal Government in various ways. Several government agencies retain title to these lands and control their surface use, but no statute permitted mineral leases on most of them.

Similar bills, sponsored by Sen. E. V. Robertson and Rep. Frank Barrett of Wyoming, had been reported some time ago by the public lands committees of the two houses. Early last week the House was calling its calendar for bills which could be taken up by unanimous consent, and when this measure was reached there were several objections, apparently in the belief that it had something to do with the controversial tidelands issue. After a couple of days of cloakroom negotiations the bill was again brought up under unanimous consent and the public lands committee agreed to an amendment stating that it in no way affects leases, exploration permits, or mineral rights in any tidelands, submerged lands, or the 3-mile zone off the coast.

At the same time the Senate passed its own version of the bill. However, on the day before adjournment the discrepancy was caught, and without any debate the Senate accepted the House bill, tidelands amendment and all, thus clearing it for the White House.

In addition to the leasing authority, the bill provides that the Bureau of Land Management shall consolidate into its offices the records, title papers, and other documents pertaining to acquired lands, even though other agencies retain jurisdiction for other purposes.

New Fight for FPC Curb

THE fight over amendments to the Natural Gas Act in the next session of Congress is going to be bitter indeed, according to threats of the two principal backers of the bill which was bottled up by the Senate commerce committee.

Sen. E. H. Moore of Oklahoma proposed an investigation of reports that the Federal Power Commission had lobbied against the bill, and Rep. Ross Rizley of the same state announced that he would move to impeach some of the commissioners if investigation confirmed his belief that they had been using public funds to propagandize Congress to defeat the measure.

The commission last week made public distribution of a letter it sent Chairman White of the Senate committee analyzing the Rizley bill, H R. 4051, in the form in which it passed the House, and detailing a great many objections to it. This letter, however, was in response to an inquiry from the chairman, a routine procedure, and it is not particularly unusual for a government agency to release copies of such comments on pending legislation.

What Moore and Rizley are provoked about is the appearance in many newspapers during the past few weeks of a number of articles, all in quite similar vein, declaring that FPC would lose most of its power to fix gas rates if the bill were passed and pointing out the dollar savings to gas consumers in various areas resulting from FPC rate orders in the past. The Oklahomans think this is the propaganda which killed the bill, and they also think that it could have originated nowhere else than right in the FPC offices.

Interior Department Funds

BUREAUS of the Interior Department of special interest to the oil and gas industry will have considerably more operating funds for the 1947-48 fiscal year than appeared probable last spring when the economy-minded House appropriations committee got through pruning their appropriation bill. While their stipends are far less than they asked and much below what the Budget Bureau recommended, they will be able to carry along most of their essential activities without too drastic curtailment.

The Bureau of Land Management, which asked for a much enlarged staff to catch up on its backlog of work in connection with mineral leases on the public domain, was allowed $5,000,000 by the Budget. The House cut this to $3,600,000, the Senate raised it to $4,078,440, and the compromise agreed to when the bill was finally sent to the White House was $4,035,440.

The Geological Survey was given $18,000,000 by the Budget, $9,000,000 by the House, $10,200,000 by the Senate, and $10,091,340 in the final bill.

The Bureau of Mines was allowed $16,800,000 by the Budget, $10,500,000 by the House, $12,400,000 by the Senate, and $12,035,800 in the bill as passed.

For the Interior Department as a whole, including these three bureaus, the Budget Bureau recommended $296,000,000, the House voted only $161,000,000, the Senate boosted this to $215,000,000, and the final compromise was $194,500,000. The heaviest cuts were made in funds for reclamation and power development, and by comparison the regular operating bureaus were treated almost generously in spite of the austerity diet on which they will have to live during the next 11 months.

During the first month of this fiscal year, while Congress wrangled over the appropriation bill, the Interior Department lived a strenuous existence under authority of a "continuing resolution" which permitted payroll expenditures at not more than one-twelfth the amount which it was estimated Congress might approve. Now that the bill has finally passed, the department can make definite plans as to what projects and personnel can be retained.

The Oil and Gas Division, which is budgeted under the secretary's office, may even be able to expand a little bit in its Washington operations, though its Connally "hot oil" work must be curtailed. OGD has $275,000 for this fiscal year of which $175,000 is earmarked for the Connally Act. The Budget recommended $218,900 for the Connally Act, and when the bill passed the House with only $124,000 for this purpose tentative dismissal notices were sent to many employes. The additional $51,000 will permit rescinding some notices.

The final bill contains language identical with last year's law permitting OGD to coordinate and unify government petroleum policy, and allows $100,000 for this work. The Budget called for $245,000, but the House bill provided nothing at all. This required OGD to trim its Washington staff and for the past month it has consisted only of Director Max Ball and a staff of three petroleum experts, plus some clerical assistants. The new funds may permit the addition of one staff man—still a very small group but a percentage increase of 33⅓ per cent.

Louisiana Allowable Down; Kansas Sets Crude Record

An August allowable of 468,359 bbl. daily has been set by the Louisiana Department of Conservation. The figuse is 2,936 bbl. daily below the July figure but 6,688 bbl. daily above the June allowable.

In Kansas the Corporation Commission set the August allowable at 290,000 bbl. daily, unchanged from July.

At the same time it was revealed that Kansas production of crude oil for the week ended July 26 was 296,400 bbl., a 1,650-bbl. increase over the previous week and a new high for the state. Pipe-line runs of Kansas crude oil averaged 296,404 bbl. daily during the week ended July 21, the highest level in 3 years and 1,658 bbl. daily above the preceding week. It was the third consecutive week in which a new peak was established.

Higher Crude Production Improves Outlook, Economist Says

AN increase in crude-oil production of approximately 300,000 bbl. daily since earlier this year has materially improved prospects that the petroleum industry will meet product requirements this winter, A. J. McIntosh, Socony - Vacuum Oil Co., Inc., economist, said last week.

A. J. McINTOSH

He outlined a somewhat optimistic forecast for petroleum supply particularly in the East, but at the same time warned that unusually cold weather, economic or military conditions could alter the situation. His discussion was given in New York at a meeting of the New York Security Analysts Society.

The Midwest presents a different problem, he indicated, since the limiting factor there is a shortage of adequate facilities for transportation, specifically pipe lines. However, the midwestern area will be short only from 5 to 6 per cent of next winter's demand as a whole, and the result will be inconveniences not hardships. "Any shortages that occur in that region," he continued, "undoubtedly will be spotty and of brief duration."

McIntosh pointed out the industry is now producing about 5,100,000 bbl. daily against 4,800,000 bbl. daily the first quarter of this year. The anticipated increase was only 170,000 bbl. daily.

Contributing Factors

Other contributing factors include the placing in service of additional tankers, help in obtaining needed steel for additional pressure tank cars, and the fact that uneconomically higher costs were borne by some segments of the industry in transporting petroleum products.

"When the petroleum industry foresaw the impending shortages in the early part of this year," McIntosh said, "it began intensive studies and efforts to alleviate this condition by as fast and as feasible methods as seemed possible."

Contributing also to the improved supply picture, according to McIntosh, was an increase of 20,000 bbl. daily over expectations in crude-oil imports and in the production of natural gasoline. Noting that the United States will be a "net importer of oil' 'this year for the first time since 1922, when large amounts of Mexican crude flowed into this country, the economist nevertheless discounted any belief that Middle East crude would be imported in quantities. While he conceded that a trickle of oil may come here from that area, he could not confirm reports that Socony-Vacuum still plans to import Persian Gulf crude. He remarked, however, that the company had planned to ship in a small amount earlier.

At the start of the campaign to forestall any shortages, doubts as to the ability of the petroleum industry to absorb and process today's high crude production, McIntosh said, whereas current estimates now indicate that the industry might be able to handle still more crude oil up to about 5,300,000 bbl. daily.

Price-Relief Amendment in U. S. Contracts Invalidated

The U. S. comptroller-general has declared invalid an amendment to federal petroleum supply contracts allowing payment for products at posted rather than below-market contract prices.

The decision is expected to have a serious adverse effect on current efforts of federal agencies, particularly the Army and Navy, to obtain bids covering their petroleum requirements. There is some indication the ruling may be contested in the U. S. Court of Claims.

The Treasury Department has notified 103 companies holding petroleum supply contracts with the Federal Bureau of Supply, of the decision. The amendments were negotiated to give the companies price relief following the expiration of the Office of Price Administration when higher crude postings lifted products prices substantially above the ceiling prices set out in the contracts made prior to June 30, 1946. It was estimated the refunds required of the companies will be more than 2 cents a gallon for deliveries over the past year and will approximate several million dollars.

Strike at Pure's Cabin Creek Refinery Settled

Pure Oil Co.'s Cabin Creek refinery, near Charleston, W. Va., was reopened July 25 with the signing of a contract ending a 117-day strike. The refinery, employing 270 men, has a crude capacity of 5,500 bbl. daily and a cracking capacity of 14,300 bbl. daily.

The reopening of the plant followed by 10 days the settlement of a strike at Pure's largest refinery, the Smiths Bluff plant at Nederland, Tex. A strike at a third refinery, the 15,500-bbl. crude capacity plant at Toledo, Ohio, still has not been settled.

Strike at the three refineries began in March in a union effort to obtain a company-wide contract, waived by the union in the first two settlements.

The new Cabin Creek contract provides for a wage increase of 14 cents an hour for the labor forces and an 18-cent increase for operating personnel. The contract is effective until October 1, 1948, and provides that wage discussions may be reopened as of February 1, 1948. J. Porter Langfitt, Pure vice president in charge of refining, said the processing of an estimated 32,000,000 gal. of petroleum products was interrupted by the strike and more than $250,000 in wages lost by Cabin Creek employes.

Luling to Celebrate Silver Oil Anniversary

The twenty-fifth anniversary of the discovery of Luling field in Southwest Texas will be commemorated August 9 with a Silver Anniversary Jubilee in Luling which is expected to attract several thousand persons.

Highlighting the day's activities will be a program at the discovery well honoring Edgar B. Davis whose investments finally showed that oil existed at Luling. The field, the first in which production was found in the Edwards limestone, has produced approximately 89,920,000 bbl. since its discovery in 1922. The program for the celebration includes a parade, rodeo, street carnival, and other events. Ernest O. Thompson, chairman of the Texas Railroad Commission, is scheduled to speak at a dinner the evening of August 9.

Bruce K. Brown to Head Military Advisory Group

Bruce K. Brown, president of Pan-American Petroleum Corp. and vice president and director of Standard Oil Co. (Ind.), has been elected chairman of the Military Petroleum Advisory Committee.

The Military Petroleum Advisory Committee was created by Secretary of the Interior Krug at the request of the secretaries of war and navy to study the petroleum aspects of military plans and problems and to provide the Army-Navy Petroleum Board and the Oil and Gas Division with expert counsel and information. The committee is composed of 15 outstanding members of the oil and gas industry.

Duplex or Triplex...these "OILWELL" Steam Slush Pumps *really perform*

WHEN you want large volumes of mud at high pressure, either of these two pumps is a good choice.

The No. 220 Duplex is a compact, heavy-duty pump that is moderate in weight and has a theoretical displacement of 820 gallons per minute when operating at 50 R.P.M.

The No. 320-HD Triplex is a heavy-duty pump that has a theoretical capacity of 1,225 gallons per minute when operating at 50 R.P.M.

Both pumps have valve caps and fluid cylinder heads of forged steel and fluid ends are rated* at 4,000 p.s.i. discharge pressure. They are designed with such outstanding features as positive lubrication of the steam cylinders, steam valves, and the fluid piston rods; DI-HARD liners; heavy-duty liner spacers and weather-proof roller-bearing valve mechanism.

SPECIFICATIONS

SERVICE RATINGS	DUPLEX No. 220	TRIPLEX No. 320-HD
Number of Cylinders	2	3
Steam Cylinder Bore ... inches	18	18
Maximum Liner Size ... inches	8	8
Stroke ... inches	20	20
Theoretical Displacement gallons per revolution	16.38	24.55
Stalling pressure with full size liners ... p. s. i.	2030	2030
Maximum Working Pressure:		
Discharge ... p. s. i.	4,000	4,000
Suction ... p. s. i.	3,000	3,000
Rated Steam Working Pressure ... p. s. i.	400	400
Dimensions:		
Overall Length (Pump only, less Suction Strainer)	11'2"	11'7⅝"
Overall Width (Pump only)	5'7"	7'10"
Overall Height Including Skids and Air Chamber	8'1"	8'10"
Shipping Weights, Mounted on Standard Steel Skids:		
Domestic ... pounds	23,800	29,600
Export ... pounds	24,750	30,600

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PERSONALS

Works Superintendent Began Career as Chemist

HENRY A. RICKETT, recently named superintendent of the East Providence, R. I., Works of Socony-Vacuum Oil Co., Inc., is a 33-year veteran of service with Socony-Vacuum and predecessor companies.

Rickett, a native of Newark, N. J., started with Standard Oil Co. of New York July 5, 1914, as a research chemist. He graduated from the Worcester Polytechnic Institute in 1912 with a bachelor of science degree.

In 1918, Rickett was transferred to East Providence as assistant superintendent of the grease and compounding works, and, in 1919, was placed in charge of the laboratory. He became assistant superintendent of the East Providence Works in 1932, holding this position until his elevation to the superintendency. He succeeded C. W. Shaeffer who retired.

E. V. Murphree, executive vice president of Standard Oil Development Co., has been elected president to succeed **Robert P. Russell,** who has resigned to become technical assistant to International Basic Economy Corp., an organization formed by Nelson Rockefeller to improve the agricultural economy and promote agricultural and nutritional research and education in other countries. Murphree, a graduate of the University of Kentucky, joined Standard Oil Co. (N. J.) in 1930. He was named manager of research and development for Standard Oil Development Co. in 1938, and became executive vice president in 1946.

C. E. Bellows, geologist, The Texas Co., has been transferred from Mattoon, Ill., to Mt. Pleasant, Mich.

Russell A. Keck has been elected vice president in charge of sales of Kendall Refining Co., Bradford, Pa. He formerly was general manager in charge of sales.

D. E. White has been made superintendent of maintenance for Magnolia Pipe Line Co., and **C. R. McKinney** was named assistant superintendent of maintenance in Central Texas, West Texas, and the northern division. Headquarters for both men will be in Dallas. **C. B. Swanner,** Dallas, is now assistant manager of the safety department, and **H. W. Simmons** will succeed Swanner as divisional safety supervisor, southern safety division, with headquarters in Houston. In Magnolia's natural-gas department, **O. B. Zeek** has been named Wewoka district superintendent with headquarters at Stonewall, Okla., and **J. A. Upton** was made Seeligson district superintendent with headquarters at Premont, Tex.

T. J. Kirkpatrick, former measurement engineer, Glenarm, Ill., for Panhandle Eastern Pipe Line Co., has been transferred to Kansas City as assistant superintendent of gas measurement. He replaces **Pat H. Miller** who resigned May 15 to join Texas Eastern Transmission Co. as superintendent of gas measurement at Shreveport, La. **Joe Tiner,** former meter engineer at Mexico, Mo., has assumed Kirkpatrick's old position. Recent transfers in Panhandle Eastern include: **H. R. Graves,** foreman, from Delavan, Ill., to Zionsville, Ind.; **James Parkinson,** engineer, Hansford, Tex., to Liberal, Kans., as pressure dispatcher; and **Claude Bramlet,** pressure dispatcher, Liberal office, to Liberal gasoline plant as assistant gas engineer.

C. Kenneth Baxter, Philadelphia, has been elected president and chairman of the board of Deep Rock Oil Corp., succeeding Henry N. Greis, who died July 16. Baxter, a Deep Rock director since 1941, is an executive of Donner Corp., Philadelphia investment company, and holds directorships in a number of other companies. **Orville C. Kerr,** Tulsa, was elected executive vice president of Deep Rock, a position which has been vacant since the death of W. R. Francisco several years ago. Kerr has been secretary-treasurer.

Charles Hansen, Shell Oil Co., Inc., drilling foreman, has been transferred from Bakersfield to Ventura. Other West Coast Shell transfers and promotions include: **Loy M. Charter,** exploitation engineer, from Long Beach to Los Angeles; **Ross E. Davenport,** from roustabout at Simi station, to engineer, Somis station; **Sigurd Furnbotten,** from roustabout at Simi station to engineer at Mulholland station; **Edward E. Martin,** from fireman engineer at Kettleman; **Kurt F. Pilgram,** exploitation engineer, from Ventura to Long Beach; and **Roy E. Robinson,** drilling foreman, from Bakersfield to Ventura. In Shell's exploration department, **Arne Junger,** senior seismologist, has been transferred from Calgary, Canada, to the Rocky Mountain area; **James W. Locke,** party manager, has been transferred from Long Beach to Sacramento; and **Rayman Sturdevant,** seismologist, has been transferred from Bakersfield to Sacramento.

Jim Wheeler, a recent graduate of the University of Texas, has joined

Seated in the above photograph is Edward S. Holt, Salt Lake City, recently elected president of Utah Oil Refining Co. at a meeting of directors in Salt Lake City. Standing are F. R. Clark, newly elected director, left, and T. A. Dines, Denver, retiring president. Holt, who has been associated with the company 34 years, had been executive vice president since September 27, 1945. Refinery superintendent in 1918, Holt was elected a director in 1925 and vice president in charge of manufacturing in 1934

PERSONALS

the geological department of Tennessee Gas & Transmission Co.

W. H. HALES

W. H. Hales has been appointed chief engineer of the manufacturing department of the Standard Oil Co. of California. Hales, a 1923 Stanford University graduate, joined Standard in 1924 as a construction superintendent at the company's El Segundo refinery and was made chief engineer of the Richmond plant in 1943. Other

W. H. SPAULDING

J. O. CIPRICO

manufacturing department appointments announced include **W. H. Spaulding** as assistant chief engineer and **J. O. Ciprico** as designs engineer. Spaulding has been departmental job engineer. Ciprico has worked in various engineering capacities for the company since 1919.

Thomas E. Nix, independent producer in Holdenville, Okla., has moved to Oklahoma City and organized Fortune Oil Co.

A. W. Schofield, assistant manager and director, Kuwait Oil Co., London, England, attended Gulf Oil Corp.'s recent Gulf-Day picnic at Odessa, Tex.

Murrel D. Thomas, former geologist for The Texas Co. at Ardmore, has become chief geologist for Eason Oil Co., Oklahoma City. He succeeds **Kenneth Wheeler** who has resigned to become a consultant.

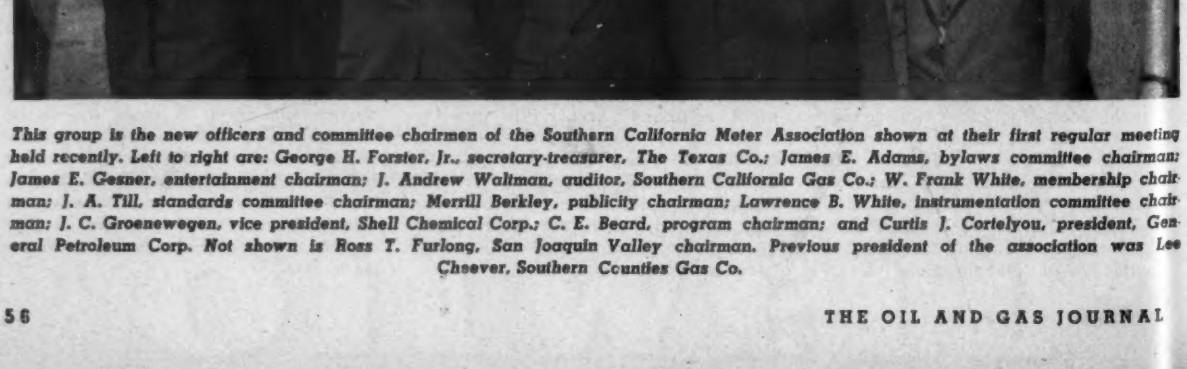
Mark Stump, geologist, has been placed in charge of an office opened in the McBirney Building in Tulsa by Blackwell Oil & Gas Co., Cushing, Okla.

John C. Reid has been promoted from associate chemist to senior chemist of Atlantic Refining Co. at Philadelphia. Other recent advancements for Atlantic in Philadelphia include: **Percy Hcrt,** assistant electrolysis engineer to electroylsis engineer; **William Brewer** and **Vincent Satinsky,** junior chemical operator to assistant chemical operator; and **Robert L. Honnen,** junior automotive operator to assistant chemical operator. Recent field promotions of Atlantic include: **William W. Wallace,** lease pumper to production foreman, Odessa, Tex.; **Charles G. Faubion,** observer to senior observer, Andrews, Tex.; **Marvin R. Thomas,** district materialman, Aransas Pass, Tex., to assistant district materialman, Venezuela; **Lonnie K. Ledbetter,** electrical technician, Dallas, to senior observer, Shawnee, Okla.; **Edward R. Phillipp,** junior mechanical engineer to mechanical engineer, Dallas; and **James A. Cox,** district operating clerk to chief clerk, Longview. In Venezuela, **James H. McLay** has been promoted from computer to seismologist; **Albert A. Mueller,** junior petroleum engineer to petroleum engineer II; and **Robert H. Robie,** senior geologist to subsurface geologist.

H. Fred Whitney, Jr., formerly of the process laboratory, Standard Oil Development Co., has been appointed assistant chief chemist of the Baltimore refinery, Standard Oil Co. (N. J.) Three transfers on training assignments have been made in the same plant. **Harry F. Ferguson, Jr.,** has become technical assistant in the cracking division of the process department; **Anthony J. DiGennaro** has been assigned as technical assistant to the superintendent of the oil-movement and storage department; and **Frank A. Gaidis** is newly assigned as technical assistant to the general foreman of the storage and shipping division.

W. F. Earl has been appointed to succeed **Burton C. Dunn** as district geologist for Kansas and northwestern Oklahoma for Ohio Oil Co. Dunn and **M. J. Boreing** will operate as consulting geologists in Durango, Colo.

M. D. Pool, station engineer at Hobbs, N. M., for Shell Pipe Line Co., has been promoted to field gager and transferred to Eunice. In other Shell changes, **F. J. Griffith,** pipe liner, has been transferred to Colorado City as general clerk; **Z. Sumlin,** tank-farm gager at Kilgore, has been named field gager; and **A. M. Tuttle,** pipe liner at Douglas, has been transferred to Kilgore as tank-farm gager.



This group is the new officers and committee chairmen of the Southern California Meter Association shown at their first regular meeting held recently. Left to right are: George H. Forster, Jr., secretary-treasurer, The Texas Co.; James E. Adams, bylaws committee chairman; James E. Gesner, entertainment chairman; J. Andrew Waltman, auditor, Southern California Gas Co.; W. Frank White, membership chairman; J. A. Till, standards committee chairman; Merrill Berkley, publicity chairman; Lawrence B. White, instrumentation committee chairman; J. C. Groenewegen, vice president, Shell Chemical Corp.; C. E. Beard, program chairman; and Curtis J. Cortelyou, president, General Petroleum Corp. Not shown is Ross T. Furlong, San Joaquin Valley chairman. Previous president of the association was Lee Chesever, Southern Counties Gas Co.

Joseph T. Wilson, Jr., has been appointed manager of the general accounting department of Sun Oil Co. **William F. Yorty** has been named manager of the company's new transportation accounting division.

Byron Rife has been elected vice president of Holly Development Co., independent producing company with headquarters in Los Angeles. Rife will have charge of the company's development of production in Texas, with offices in the Milam Building, San Antonio. Rife, a former Texas independent operator, entered the Army before Pearl Harbor and advanced to the rank of colonel.

Loffland Brothers Co., Inc., has announced the resignation of **Harold L. Sullivan** as president of the company, effective September 1 or at such earlier date as his successor may be appointed. Sullivan for some time after September 1 will act as special consultant to the company.

John L. Bible has resigned as executive vice president of North American Geophysical Co. and has established offices as a consulting geophysicist. With **U. E. Neese** and **Fred A. Lauterbach** he has formed Tidelands Exploration Co. with offices in Houston. Neese was formerly in the geophysical and geological departments of Stanolind Oil & Gas Co. and recently with North American. Lauterbach is also a former Stanolinde employe and during the past year supervised gravity operations in the Gulf of Mexico for Robert H. Ray Co.

James F. Gibbs, former Wichita Falls, Tex., consulting geologist, has succeeded **S. V. White** on the geological staff of Panhandle Refining Co. White resigned to become a consultant.

Richard Jodrey has joined Ohio Oil Co. as assistant geologist, Michigan division. Prior to joining Ohio, Jodrey was with Magnolia Petroleum Co. at Lake Charles, La.

Jack P. Hays will resign his position as senior petroleum engineer with Magnolia Petroleum Co., Dallas, effective August 15, to enter private business in southern California. Hays is widely known in Texas engineering and educational circles, having also served with Shell Oil Co., Inc., and Seaboard Oil Co. He was associate professor of petroleum engineering at Texas A. & M. College for 5 years. His new residence will be at Redondo Beach, Calif.

Clayton Wallace has been appointed Michigan production foreman for Carter Oil Co., succeeding **C. H. Evans,** who has been transferred to the St. Elmo, Ill., district. **Paul Stamps** has been transferred to Michigan as assistant to Wallace.

SHIFTS—

Eugene Stebinger, geologist, Standard Oil Co. of New Jersey, Palo Alto to Los Altos, Calif.; **Dick Pizzati,** engineer, Caribbean Petroleum Co., Old Ocean, Tex., to Maracaibo, Venezuela; **Richard D. Holt,** geologist, Humble Oil & Refining Co., Houston to Midland, Tex.; **Dick S. Luse,** superintendent, Rowan Drilling Co., Odessa to La Mesa, Tex.

J. A. Archer, Jr., engineer, Schlumberger Well Servicing Corp., Victoria to Alice, Tex.; **J. L. McAdams,** geologist, Bishop Oil Co., Wichita Falls to Lubbock, Tex.; **J. M. Myers,** foreman, Helmerich & Payne, Inc., Andrews to McCamey, Tex.; **W. V. Odom,** superintendent, J. F. Sharp Drilling Co., Plaquemine, La., to Brookhaven, Miss.; **M. J. Millet,** foreman, The Texas Co., Opelousas to Hammond, La.

D. C. Chambers, superintendent, N. H. Wheless Drilling Co., Houma to St. Martinville, La.; **D. D. Smith,** superintendent, Keating Drilling Co., Olney, Ill., to Powell, Wyo.; **L. H. Simpson,** superintendent, Helmerich & Payne, Inc., Pelahatchie to Brookhaven, Miss.; **L. L. Broadus,** superintendent, Broadlee Drilling Co., Laurel, Miss., to Bonifay, Fla.; **R. J. Metcalf,** engineer, Gulf Oil Corp., Philadelphia to Havertown, Pa.; **Michael Pintea, Jr.,** engineer, Creole Petroleum Corp., Maracaibo to Caracas, Venezuela.

DEATHS

Claude A. Johnston, 63, drilling contractor, died July 22 in a Wichita Falls, Tex., hospital.

Ernest Cockrell, Houston independent oil operator who opened the Gulf Coast Stratton Ridge salt dome to production last year, died July 24 in Raton, N. M., en route to his ranch near Maron, Wyo.

Claude Alva Johnston, 64, Frederick, Okla., former Wichita Falls, Tex., drilling contractor, died July 22 in a Wichita Falls hospital.

George E. McCutcheon, 86, independent oil operator prior to his retirement several years ago, died July 21 in a Tulsa hospital.

Arthur LaMotte, 76, former manager of the technical-service section of E. I. du Pont de Nemours & Co., Inc., died recently in Oakland, Calif.

H. H. Royer, independent Kansas oil operator and a partner in Royer & Farris Drilling Co., died recently in Wichita.

Ludwig Schmidt, 51, assistant supervising engineer of the Petroleum Experiment Station of the Bureau of Mines, Bartlesville, Okla., died in Bartlesville July 23. Schmidt, who joined the Bureau of Mines in 1921 after graduation from the University of Oklahoma, was well known throughout the industry for his work on evaporation losses, salt-water disposal problems, and other subjects. Schmidt also was chief of the secondary-recovery section of the Bartlesville station and active in various oil-industry technical organizations.

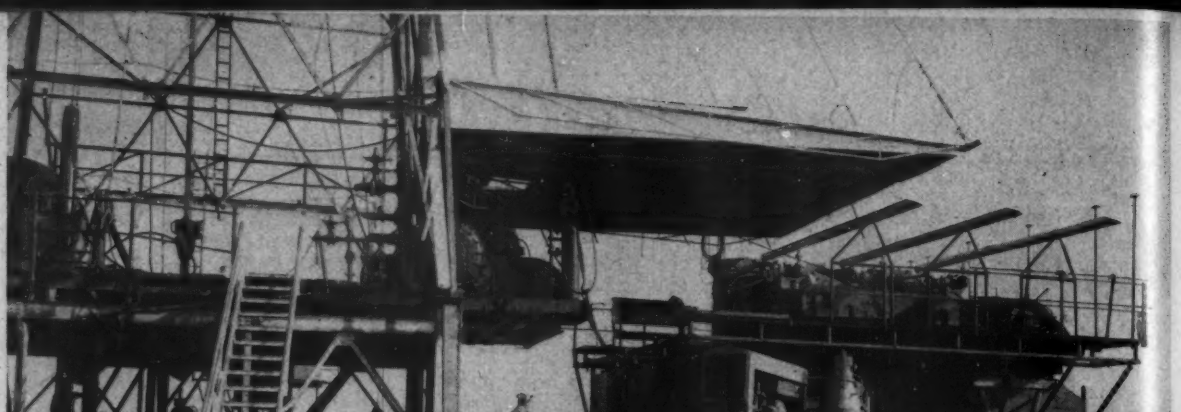
James H. Shay, 73, retired driller, died July 24 at his home in Bradford, Pa.

Harry C. Chapman, 36, assistant manager of the northwest division of Carter Oil Co. in Billings, Mont., died July 24 in Billings. Chapman, who was chairman of the legal and legislative committee of the Rocky Mountain Oil and Gas Association, was an attorney in Carter's legal department in Tulsa 9 years before going to Billings in 1944 as division counsel. He was made assistant division manager last January.

Glen Keith Kidwell, 59, oil dispatcher for Empire Pipe Line Co. 18 years and previously dispatcher for Cosden Pipe Line Co. 6 years, died July 24 in Tulsa.

William R. Fitch, 73, retired drilling contractor, died July 24 at his home in Tulsa.

Wallace Robert Seaton, 68, retired supervisor of communications for Phillips Petroleum Co., died July 22 in Bartlesville. A resident of Bartlesville 29 years, he was chief electrician for the company before becoming chief communications supervisor.



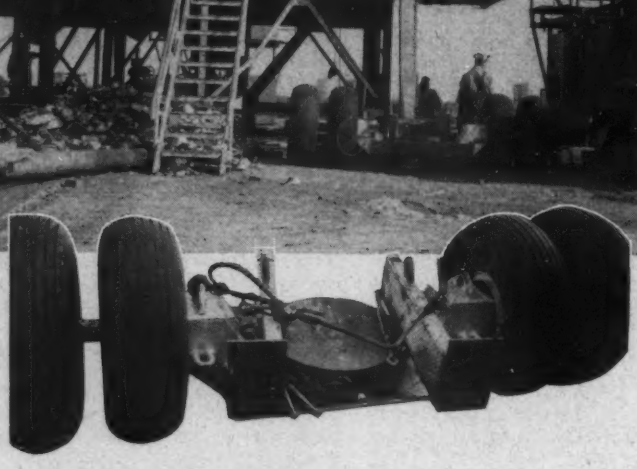


Fig. 1—First step in moving the heavy rig was to skid the engine unit away from the derrick floor. The draw works and engine shed were guyed to the derrick. The two loads, derrick and engine unit, were then moved intact without further tearing down

Fig. 2—Each unit comprises four C-47 airplane wheels mounted as duals on separate axles which are welded to a heavy reinforced cradle. The circular plate in the center carries the load. It is pivoted to allow axles to swing and change direction of movement, and tilt on uneven terrain without affecting uniform distribution of the load among the four tires

Rolling

HEAVY RIGS ON WHEELS

by George Weber

A NEW method of moving rigs on wheels is attracting the interest of rig builders and drilling contractors in West Texas. Originated on the Gulf Coast, the new practice is now being employed under varying conditions in the Permian basin. Mechanical refinements and improvement in technique are expected to follow the experience gained from current contracts in that area.

A timely problem in the Permian basin is reduction of a drilling rig's idle period between completion of one well and spudding of the next one. In that progressive drilling area, over 90 per cent of all wells are contracted, and a brisk competition in rig efficiency has resulted. Drilling time per well has been steadily reduced since the war and the progress in penetra-

Fig. 3—Each derrick corner was jacked up, and the wheeled dolly rolled into position. After loading, the unit was bolted to side plates clamped along the sides of the sills. The steering mechanism is mounted on the outside plate

Fig. 4—In movement, the derrick is guided by manual operation of the ratchet handle which actuates a worm gear-driven toothed wheel. By means of a chain and cable drive, the wheeled units are swung right or left. On this corner, a left turn is limited by a clearance of about 1 ft. between tires and derrick substructure

tion rates has reached a point where further improvement with existing methods will be slight. Time saved between contracts offers the best possibility at present, for spreading overhead rig costs over a greater number of drilling operations.

The new service, now available on a commercial basis by K & K Contractors, Inc., Houston, has been used in skidding different types of rigs on the Gulf Coast and Permian basin. One of the most recent contracts, moving a heavy rig one location in Wheeler field of West Texas, provided an interesting example of what can be done with wheels.

The rig, owned by Carl B. King Drilling Co., Midland, is a new one (The Oil and Gas Journal, July 5, 1947), highly unitized for rapid movement in several loads. The engine unit, mounted on two heavy water tanks, was designed for easy dismantling and rigging, requiring several loads in a normal move. When the decision was made to skid the unit intact, on wheels, the tanks were joined by additional bolted braces and the engine floor was reinforced with I-beams welded by braces to supports bolted to the tank sides. As shown in Fig. 1, the entire unit was first skidded away from the derrick, and later wheeled as a single load to the new location.

Engine-shed supports on the engine floor were disconnected and the shed was secured to the derrick by means of guy lines. Guys also added further support to the overhanging draw works and transmission assembly which remained in place on the derrick floor. The rotary table, kelly, blocks, wire lines, hydromatic brake, and other derrick equipment were moved in one load with the derrick.

Actual displacement of the complete rig required 2 days, which time shows possibilities of improvement. Time was saved principally in obviating the dismantling and rerigging of

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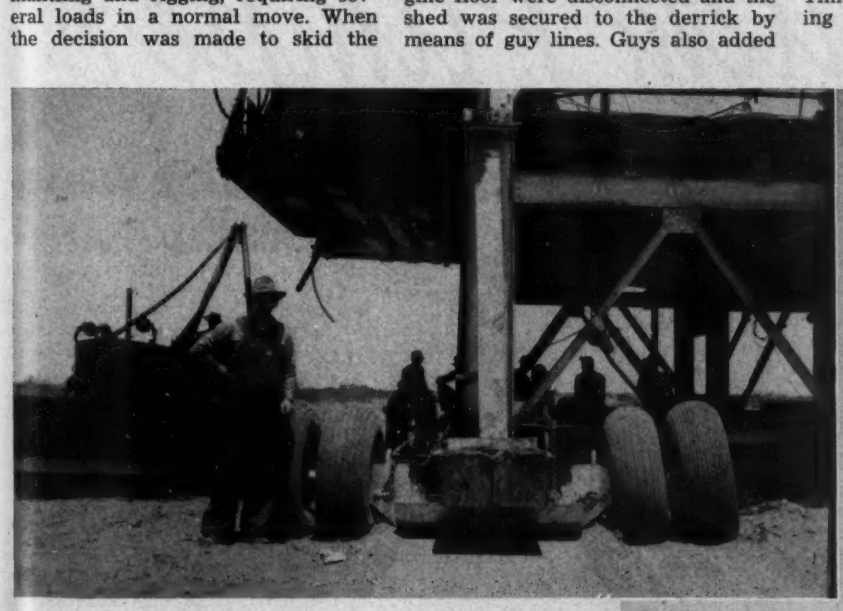


Fig. 6—The two units supporting the draw-works corners of the derrick carried well over half the total load, and in soft sand, the skid plates touched ground. C. W. Kelly, left, is one of the brothers who designed and operate the new rig-moving devices

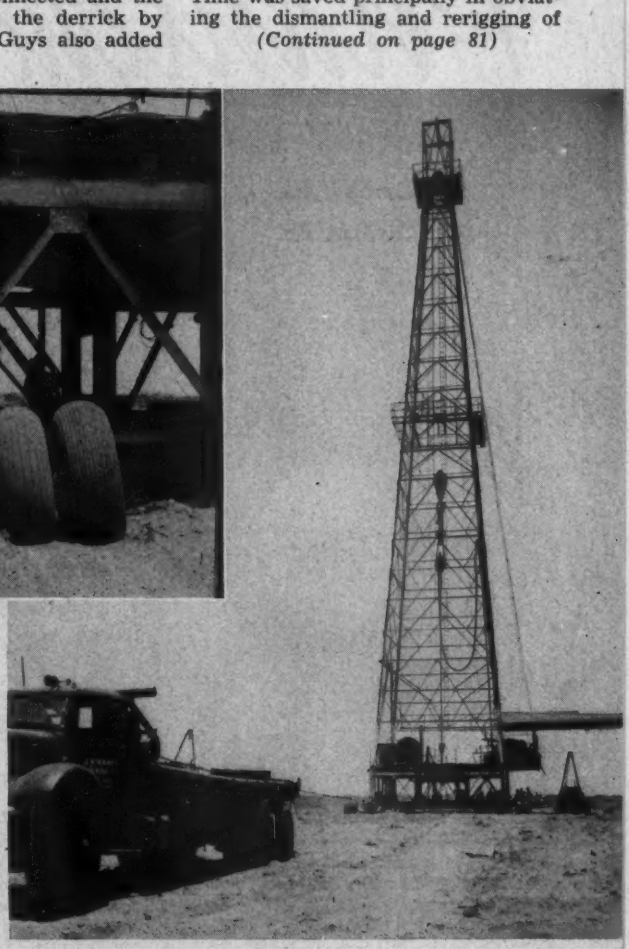
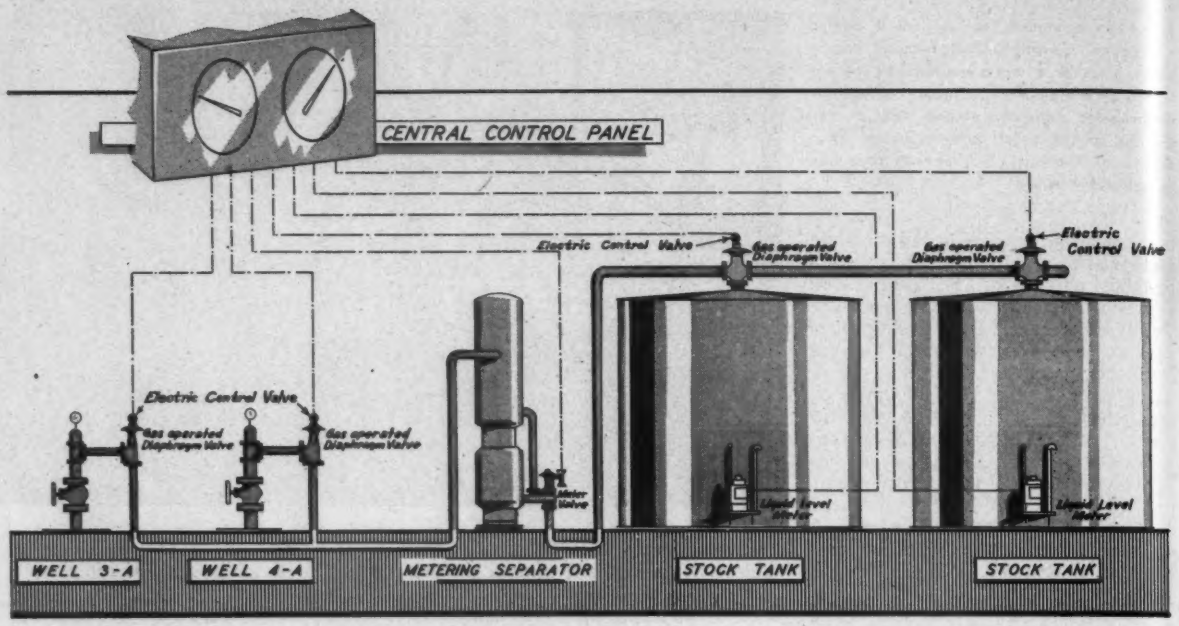


Fig. 5—The 136-ft. derrick, with all equipment loaded is moved by a winch truck and one D-8 tractor. No planking was required under wheels except in soft spots on the old location. The drilling contractor whose rig was moved as shown, estimated a saving of 2 days in rigging-up time on the new location



Schematic diagram of the "phantom pumper," as installed on the Sun Oil Co. J. W. Miller lease, Seeligson field, Texas

"Phantom Pumper"

ENABLES REMOTE CONTROL OF WELLS, TANKS FROM A CENTRALIZED PANEL

by Leigh S. McCaslin, Jr.

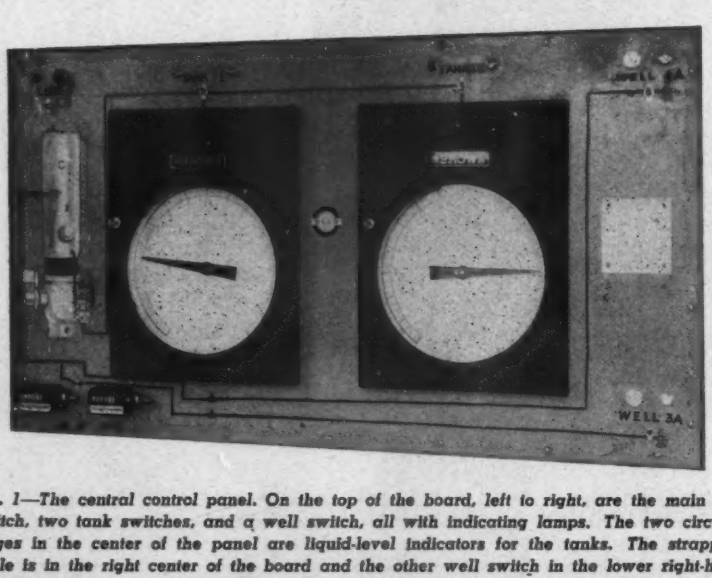


Fig. 1—The central control panel. On the top of the board, left to right, are the main line switch, two tank switches, and a well switch, all with indicating lamps. The two circular gages in the center of the panel are liquid-level indicators for the tanks. The strapping table is in the right center of the board and the other well switch in the lower right-hand corner. In the lower left-hand corner are the dual counters with one showing daily lease production and the other cumulative lease production. Black lines and a diagram of the metering separator are drawn on the panel to assist the pumper in an understanding of the operations

AN electrically operated remote well and tank-control system, popularly called the "phantom pumper," has been installed by Sun Oil Co. on its J. W. Miller lease, Seeligson field, Premont, Tex. The electrical circuits and equipment used enable the pumper to exercise complete control of wells and tanks from a centrally located panel.

This time-saving system, manufactured by Black, Sivalls & Bryson, Inc., Kansas City, Mo., was designed, built, and installed under the direction of Charles E. Harp, research engineer of that company. It has as its primary purpose the reduction of automobile or walking travel time by pumpers or switchers on large scattered leases, thus allowing more time for reports. It enables the pumper to perform the following activities from a central station without going out on the lease:

1. Selectively open and close any one tank in a battery of tanks.
2. Selectively open or shut in any one or all wells supplying oil to a chosen tank.

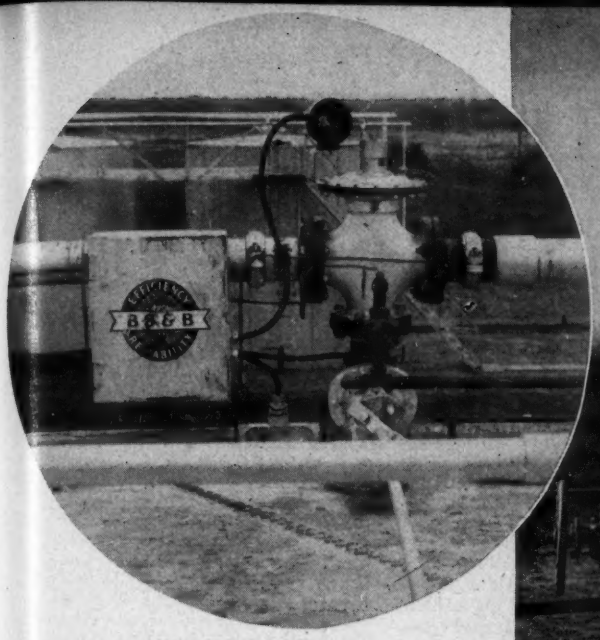


Fig. 3—A 4-in. gas-diaphragm-operated, pressure-closing valve incorporated in a 4-in. cross atop one of the stock tanks. The black circular object near top center is a Mercoid switch which is mechanically connected to the valve stem of the tank oil valve to indicate open or closed position on control panel. The gas line can be seen coming into the top of the 4-in. oil valve. Box to left of main valve houses high and low-pressure gas-drying tubes, a gas-pressure regulator, and two three-way gas valves (one for each stock-tank valve)

Fig. 2—Control equipment at well head of Sun Oil Co. 4 J. W. Miller. The gas-diaphragm-operated 2-in. valve which controls production is shown at right center. An emergency hand-operated valve is seen in center of picture. The box contains high and low-pressure gas-drying tubes, a gas-pressure regulator, and a three-way gas valve

3. Discern which tank is receiving oil at any time.
4. Read the number of barrels of oil delivered to date to the chosen tank.
5. Keep record of total production into a battery of tanks.
6. Discern liquid level in each tank.
7. Automatic "topping out" of tanks at preselected level.

The Sun installation was made on two dual-completion flowing wells which have moderate production running into two 500-bbl. stock tanks. The control panel is located 200 yards from the stock tanks, ¾ mile from one well and 1 mile from the other. (See diagram.)

The electrical control panel (see Fig. 1) is the nerve center of the control system. This panel contains a main-line switch with an indicator lamp, a manual switch for each well with a "demand" indicator lamp and a "response" indicator lamp, a manual switch for each tank with a demand and a response indicator lamp, liquid-level indicating meters for each stock tank, and dual counters with one showing daily lease production and the other cumulative lease production. Electricity, on the Sun lease, is supplied by a 115-volt, a.c. line from a nearby camp.

To put the system into operation, the main-line switch is turned to the "on" position and the red indicator

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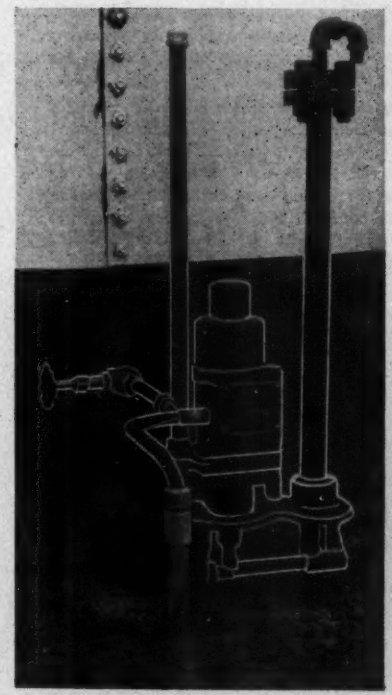


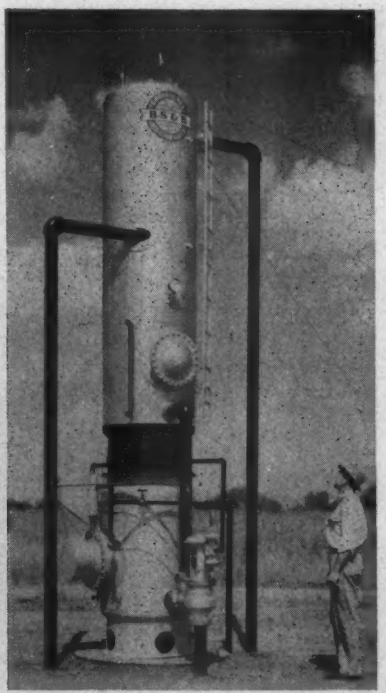


Fig. 4—(Left) A liquid-level meter body at the side of one of the stock tanks. It is connected to a liquid-level indicator on central control panel. Fig. 5—(Right) A metering chamber set under a regular separator. A Mercoid switch is mechanically connected to metering chamber valve and indicates, on central control panel, the number of dumps (barrels) of oil delivered to stock tanks

BACTERIAL RELEASE OF OIL FROM SEDIMENTARY MATERIALS

by Dr. Claude E. ZoBell*

CERTAIN bacteria promote the removal of oil from oil-bearing formations. This they do by dissolving sedimentary materials, producing gases and detergents or wetting agents, and by bodily crowding oil off from solid surfaces. Some of these bacteriological processes may have contributed to the separation, migration, and accumulation of oil in subterranean deposits during past geological ages. It has been suggested that the introduction of appropriate cultures into certain oil-bearing formations may facilitate the recovery of oil. This paper summarizes some of the preliminary observations on the problem. It is a contribution from the Scripps Institution of Oceanography, New Series No. 000, and likewise a contribution from A.P.I. Research Project 43A at La Jolla, Calif.

BACTERIAL dissolution of three different kinds of oil-bearing sedimentary materials has been demonstrated by laboratory experiments. These include the organic remains of plants and animals which contain petroleum hydrocarbons, calcium carbonate, and other calcareous materials, and gypsum or similar sulfate minerals.

Numerous kinds of putrefactive bacteria appear to be responsible for the disintegration of the organic remains of plants and animals. Hydrocarbons produced by plants and animals are often so intimately associated with the tissues of organisms that the hydrocarbons are liberated only after the decomposition of the surrounding organic matrix. The putrefaction of the remains of algae and other organisms is generally accompanied by an increase in the amount of nonsaponifiable oily substance that can be extracted. Part of this increase in oily substance is attributable to the synthesis of hydrocarbons by anaerobic bacteria, but it is believed to be mostly due to the liberation of bound hydrocarbons from the tissues of decomposing organisms.

The liberation of oil bound by organic matrix is a process which is probably of greatest importance in recently deposited sediments, although there are some students of the subject who believe that organically bound hydrocarbons may be preserved in sediments for geologically long periods of time before being liberated by the decomposition of the organic matrix.

Limestone Dissolved by Acids

There are several bacterial processes which help to dissolve limestone, dolomite, or other calcareous materials. A good many kinds of bacteria produce acids, which promote the dissolution of carbonates. Carbon dioxide produced by respiring bacteria reacts with water to give carbonic acid:

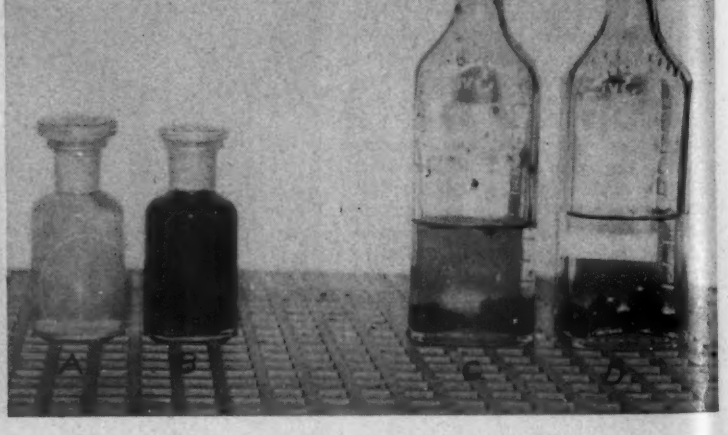
$$CO_2 + H_2O \rightarrow H_2CO_3$$

Carbonic acid, in turn, reacts with calcium carbonate or magnesium carbonate to give the corresponding bicarbonate, which is more soluble in water:

$$H_2CO_3 + CaCO_3 \rightarrow Ca(HCO_3)_2$$

Bacteria ferment various organic compounds, including petroleum hydrocarbons, with the formation of organic acids. Cellulose, for example, is fermented with the formation of butyric, lactic, propionic, acetic, and other carboxylic acids. Fats are fermented with the formation of fatty acids. Higher fatty acids are broken

*Associate professor of marine microbiology at Scripps Institution of Oceanography of University of California and director of A.P.I. Research Project 43A.



Left: The author manipulating the Warburg respirometer which is used to measure the utilization and production of gaseous metabolic products. Right: Bottles A and B illustrate a method of demonstrating sulfate reduction by bacteria. Both contain nutrient media and soluble iron salts. The iron has been precipitated as black, insoluble ferrous sulfide by the sulfate-reducing bacteria in bottle B. Notice the layer of oil floating on the surface in bottle C, which was released by the action of sulfate-reducing bacteria in nutrient media on Athabaska tar sand. Bottle D contains no bacteria

down to lower members of the series which, being more strongly dissociated, are more acidic. Proteins are decomposed with the formation of amino acids. The reductive deamination of amino acids yields more strongly acidic fatty acids.

Acids produced by various bacterial processes dissolve carbonates, thereby releasing adsorbed oil. At the same time void or pore spaces are formed, which provide for the movement or accumulation of oil. Carbon dioxide resulting from the action of acids on carbonates tends to decrease the viscosity of oil, thereby facilitating its flow:

$$CaCO_3 + 2HA \rightarrow CaA_2 + H_2O + CO_2$$

where A is a monovalent acid radical. Carbon dioxide also has a buoyant effect on oil droplets, and if generated in microspheres or structural traps of microscopic dimensions, carbon dioxide may help to expel entrapped oil.

Sulfate Rocks Dissolved

An acid reaction also helps to dissolve gypsum, anhydrite, and similar sulfate minerals, particularly in the presence of active sulfate-reducing bacteria:

$$CaSO_4 + 8H \rightarrow CaS + 4H_2O$$

Sulfate-reducing bacteria can obtain the hydrogen necessary for this reaction from the fermentation of organic matter or from a variety of inorganic reactions. Certain sulfate reducers can utilize petroleum hydrocarbons as a source of hydrogen and energy for the reduction of sulfate, and some varieties can utilize molecular hydrogen. Hydrogen may be produced in petroliferous sediments by the action of radioactive substances on hydrogen-containing compounds or it may be produced by chemical reactions in the earth's crust.

At first glance it might appear that the destruction of the strongly acidic sulfate radical (SO_4) would tend to make conditions less acid rather than more acid. It must be taken into consideration, however, that sulfate occurring in the form of poorly soluble gypsum or anhydrite has little effect on the acidity of surrounding fluids. Sulfide ion, which results from the reduction of sulfate, is itself slightly acidic when dissolved in water. Moreover, organic acids formed from carbon compounds, which are oxidized by the sulfate-reducing bacteria as a source of energy, help to make for acidic conditions.

In the laboratory, sulfate reducers have been observed to cause changes in the reaction of unbuffered culture media from an initial value of pH 7.5 or 8.0 to as low as pH 5.8. Such bacteria have been observed to dissolve appreciable quantities of plaster of paris ($CaSO_4 \cdot 2H_2O$), gypsum, and anhydrite and larger quantities of calcium carbonate and magnesium carbonate. In some experiments in which these materials were saturated with oil, their dissolution by sulfate-reducing bacteria resulted in the liberation of oil.

Carbon Dioxide Reduced

Bacteria which reduce carbon dioxide may contribute to the dissolution of carbonates. In the presence of water, carbonates tend to dissociate in the following simplified fashion:

$$CaCO_3 + H_2O \rightarrow Ca(OH)_2 + CO_2$$

The removal of carbon dioxide would cause the reaction to go to the right, particularly if acids produced by other processes neutralized the calcium hydroxide.

The bacterial reduction of carbon dioxide by hydrogen to acetic acid has been reported:

$$2CO_2 + 4H_2 \rightarrow CH_3COOH + 2H_2O$$

Other carboxylic acids may be formed from the reduction of carbon dioxide by related bacteria. If present in petroliferous sediments, the activity of such acid-producing bacteria could help to account for the porosity of limestone and the accumulation of oil.

Methane Produced by Bacteria

Methane-producing bacteria, which are known to be widely distributed in marine sediments, also reduce carbon dioxide. In fact it is the consensus that all biologically produced methane results from the reduction of carbon dioxide:

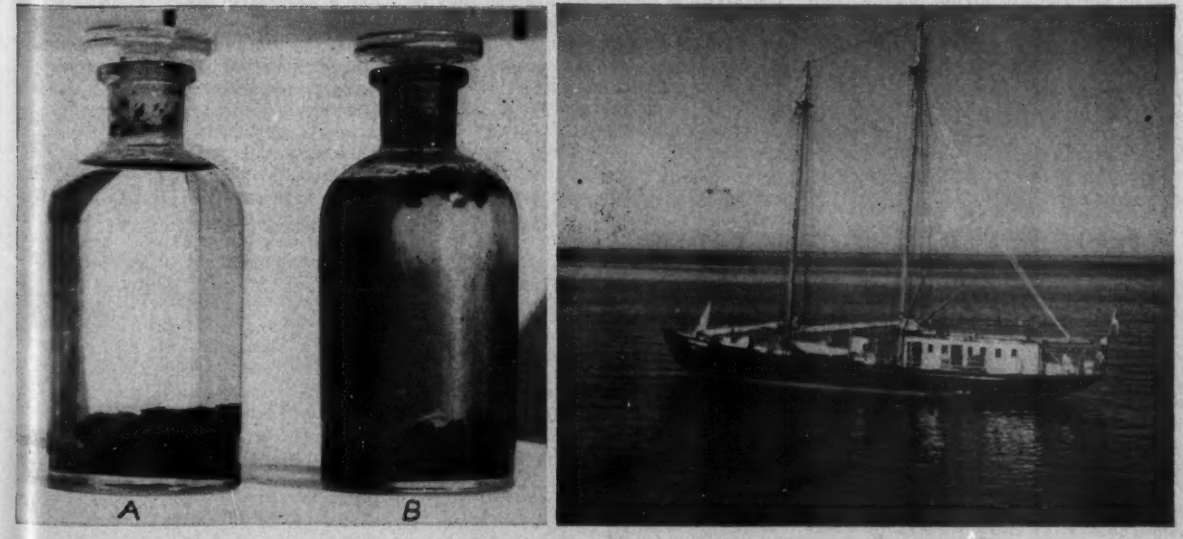
$$CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O$$

Several species of anaerobic bacteria have been shown to be able to convert mixtures of carbon dioxide and molecular hydrogen into methane. Hydrogen for the formation of methane in oil-bearing sediments may come from the fermentation of organic matter, the effect of radioactivity on hydrogen-containing compounds, or from chemical reactions in the earth's crust.

Methane produced in oil-bearing sediments would tend to dissolve oil and to make it more fluid. If produced in micro traps or dead-end cavities containing oil, methane might be instrumental in expelling entrapped oil.

The effects of methane or other products formed by bacteria can be expected to be most pronounced in

Left: Bottle B contains Athabaska tar sand and nutrient media in which sulfate-reducing bacteria have grown. Bottle A is a sterile control containing Athabaska tar sand and nutrient media. Note the oil floating on the surface of bottle B which has been released from the tar sand by bacterial action. Right: The E. W. Scripps, the 104-ft. research vessel of the Scripps Institution of Oceanography. This vessel has laboratory space and living accommodations for six scientists and a crew of nine



Main buildings at Scripps Institution of Oceanography, taken from 1,000-ft. pier

the localized area in the immediate vicinity of active bacterial cells. This, together with the fact that many varieties of bacteria have an affinity for growing on solid surfaces, fits bacteria rather admirably for removing oil from solids. A minute quantity of methane, for example, produced immediately at the surface of a solid to which oil is attached may have a much greater tendency to release oil than would the presence of appreciably larger quantities of methane a little distance away. Incidentally, most bacteria range in diameter from ½ to 1 micron in diameter, a micron being approximately .0025 in.

Wetting Agents Produced

Detergents or wetting agents produced by bacteria growing on a solid surface coated with oil help to liberate oil. That bacteria produce detergents is indicated by the observation that actively growing cultures reduce the surface tension of the medium by as much as 20 or 20 dynes per centimeter. Culture media having an initial surface tension of 65 to 70 dynes per centimeter have been found to have a surface tension of 50 to 55 dynes following the growth of bacteria. Even when rendered sterile by the addition of phenol, media having reduced surface tensions have been found to liberate oil from oil-saturated sand. The detergents responsible for the reduced surface tension of the medium would probably be even more effective in liberating oil from oil-saturated sand when produced immediately on the surface of the sand particles.

Bacterial Growth on Surfaces

The tendency of some bacteria to grow attached to solid surfaces has been studied by immersing glass slides in liquid cultures for different periods of time and then examining the slides microscopically. Such studies have revealed that many bacterial species grow preferentially or exclusively on solid surfaces. Nearly all species have some tendency to attach themselves to solid surfaces. Some attach themselves so tenaciously that they resist removal by rapidly running water or by rubbing with a cotton swab. Further details are to be found in an article by the author entitled, "The Effect of Solid Surfaces Upon Bacterial Activity," published in the Journal of Bacteriology, Vol. 46, pages 39-56, 1943.

It has been observed that certain bacteria have such marked affinity for solids that they attach themselves to and grow on glass slides coated with grease or oil. Bacteria forced themselves under the film of oil or grease and gradually set the latter free to float to the surface of the nutrient medium. After a few days' incubation, microscopic examination of glass slides showed that the entire area was covered by tenaciously attached bacteria and most of the oil was removed. Bacteria which grow on solid surfaces may have a similar effect on particles of sand or other sedimentary material covered with oil.

Can Bacteria Grow in Oil Sands?

Whether any oil-releasing organism could be functional in petroliferous sediments would depend upon the presence of nutrients and favorable environmental conditions. Finding bacteria in recently deposited sediments on the floor of the ocean at the greatest depths examined, and to a lesser extent, in reservoir fluids from oil wells, is highly suggestive that bacteria are alive and active in certain oil-bearing formations. Demonstrating the ability of bacteria to grow in oil-well brines under environmental conditions simulating conditions in subterranean deposits is considered as corroborative evidence.

Most of the bacteria recovered from oil-well brines are either sulfate reducers, methane producers, or hydrocarbon oxidizers, their relative abundance being in the order named. The most physiologically versatile and most widely distributed oil-releasing bacteria have proved to be sulfate reducers. We have isolated from marine sediments varieties of sulfate-reducing bacteria which decompose gypsum, dissolve carbonates, digest organic matter, produce carbon dioxide, form detergents, and attach themselves tenaciously to solid surfaces in appropriate nutrient media. Sulfate-reducing bacteria have been cultivated in samples of certain reservoir fluids or oil-well brines from which atmospheric oxygen has been excluded.

Sulfate Reducing Bacteria

The ability of pure or partially purified cultures of sulfate-reducing bacteria, growing in nutrient media, to liberate oil from samples of Athabaska oil sand, oil-saturated shales, cores of oil-bearing sands, and from synthetic sediments soaked with oil has been demonstrated. However, in none of the experiments has any oil been liberated from samples of oil shale from which no oil could be extracted with ether, acetone, or similar solvents. Likewise bacteria released no oil from samples of natural rock asphalt.

Although the quantity of oil released from oil-bearing sediments has been relatively small, the foregoing observations suggest that bacteria may have played an important role throughout the geological ages in liberation, migration, and accumulation of oil in subterranean deposits. The observations also suggest that the introduction of appropriate bacterial cultures into selected oil-bearing formations may help to increase the recovery of oil.

For this purpose sulfate-reducing bacteria appear to be most promising, by virtue of their physiological versatility and their ability to propagate in reservoir fluids. No one variety of sulfate-reducing bacteria liberates oil from oil-bearing sediments by all of the mechanisms recounted above and no one variety is able to grow under all types of environmental conditions where oil is found, but it may be possible to select cultures which are suitable for each particular set of conditions.

Some sulfate reducers, for example, grow best or only at temperatures ranging from 70°-85° F., others at 85°-100° F., and the range of still others is 140-160° F., etc. Thus if the temperature of the oil-bearing formation ranges from 140°-160° F., it would be necessary to select or develop a strain of bacteria which would grow at this temperature. Some sulfate reducers grow at temperatures as high as 180° F. Others grow at 32° F. or lower. The range between the upper and lower temperature limits at which most cultures will grow is relatively narrow.

Species or strains of sulfate reducers differ greatly in their salinity tolerance. *Desulfovibrio desulfuricans*, for example, grows in fresh-water media but not in sea-water media (salinity about 35,000 p.p.m.). *Desulfovibrio aestuarii* grows in sea water or isotonic salt solutions but not in fresh-water media. *Desulfovibrio halohydrocarbonoclasticus* requires a salinity of 100,000 to 300,000 p.p.m.

It may be of interest to point out

that the imposing technical names of the bacteria are made up of simple descriptive Greek roots: *Desulfo* means sulfate reducing and *vibrio* means a comma or spiral-shaped organism. In the species name, *halo* means salt, since this variety requires much salt for its growth. The suffix *clasticus* means splitting or breaking apart, which, when appended to *hydrocarbon*, denotes that hydrocarbons are attacked. It is much easier and more explicit to say or write *Desulfovibrio halohydrocarbonoclasticus* than it is to say "a comma-shaped bacterium which attacks hydrocarbons in a medium containing considerable salt." Its cousins which do not require high concentrations of salt are designated *D. hydrocarbonoclasticus*, or simply *D. HC* in the laboratory.

Different cultures of sulfate-reducing bacteria also have different pH and carbon or energy requirements. The last named species, for example, can utilize higher paraffinic hydrocarbons as a source of energy, and some strains can utilize molecular hydrogen. Other strains require lactates or similar compounds for their growth and multiplication. Their nitrogen requirements are satisfied by ammonium.

Movement in Sediments

In order to be effective in releasing oil, bacteria must be able to propagate in reservoir fluids and to permeate oil-bearing formations. Being actively motile, sulfate-reducing bacteria are not dependent upon the movement of reservoir fluids for their dissemination. Not only do sulfate reducers swim about actively but they propel themselves along surfaces and through capillary spaces by a process known as protoplasmic extrusion or extension.

In long glass tubes packed with mixtures of sand, calcium carbonate, and calcium sulfate soaked with nutrient medium, sulfate-reducing bacteria have been observed to migrate at an average rate exceeding 1 in. per day. The rate of migration was equally rapid in all directions; upward, downward, and horizontally. These and similar observations indicate that, if successfully implanted in an oil-bearing formation, sulfate-reducing bacteria might be expected to permeate the formation in all directions.

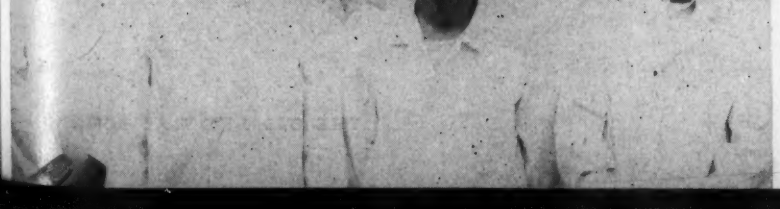
Words of Warning

The observations summarized above are based upon laboratory observations. Operators who are interested in applying the bacterial process to the secondary recovery of oil are warned that it is a tremendously large step from the test tube to an oil well. Whether sulfate reducers, methane producers, hydrogen producers, or other types of bacteria in pure culture or combinations will grow and liberate oil from oil-bearing sediments in subterranean deposits as they do in test tubes is purely conjectural. Before any positive recommendations can be made, much more experimental and development work will have to be done by trained microbiologists working in close cooperation with petroleum engineers. Although it is definitely a wildcat proposition with the odds against immediate success, the vast quantities of oil locked in sediments should offer adequate incentive for a thorough exploration of the possibilities of the bacteriological process.

Successful implantation of oil-releasing bacteria into oil-bearing materials will require considerable knowledge of the bacteria and the formation. One must be guided in the selection of appropriate bacterial cultures by the temperature, salinity, pH, utilizable organic content, and other environmental conditions that might influence bacterial multiplication and activity. Samples should be examined to ascertain if bacteria are already present in the formation. Finally preliminary tests should be made in the laboratory to demonstrate the ability of oil-releasing bacteria to grow in the reservoir fluids.

Injurious bacteria must be avoided; some bacteria modify or actually destroy crude oil. (See article by author entitled, "Action of Microorganisms on Hydrocarbons," appearing in Bacteriological Reviews, Vol. 10, pp. 1-49, 1946). Some bacteria have a corrosive effect on iron or steel structures. The growth of other injurious types of bacteria clog oil sands rather than increasing the porosity or permeability. It should be comforting to know that the most effective oil-releasing bacteria are harmless to man and have no deleterious effect on oil.

The personnel of A.P.I. Research Project 43A: Dr. W. D. Rosenfeld, D. M. Updegraff, Helen H. Whelply, F. D. Sisler, Dr. C. E. Zobell, and W. E. Hutton



Summary and Conclusions

There are several mechanisms by which bacteria can liberate oil from oil-bearing sediments. Test-tube experiments indicate that the dissolution of limestone or other calcareous materials is one of the most important mechanisms. Sulfate minerals are also decomposed by sulfate-reducing and acid-producing bacteria. The selective action of bacteria on the remains of organisms may liberate bound hydrocarbons.

Carbon dioxide, methane, or hydrogen produced by bacteria in microtraps may promote the flow of oil. Wetting agents or detergents formed by bacteria help to remove oil from sediments, particularly when the bacteria grow on the surface of solids. The growth of bacteria on solid surfaces tends to crowd off oil films.

Laboratory experiments have demonstrated the bacterial release of oil from samples of Athabaska oil sands, various kinds of oily shales, a large variety of synthetic sediments saturated with oil, and from a few diamond-drilled cores of oil-bearing sands. Negative results only were obtained with samples of oil shale and natural rock asphalt.

Sulfate-reducing bacteria appear to be the most versatile oil-releasing organisms. Recent experiments, however, indicate that methane-producing, hydrogen-producing, and other anaerobic bacteria growing either in pure culture or in combinations may be more effective if it proves to be practicable to inject them in oil-bearing formations with appropriate nutrients.

No specific recommendations can be made at this time except that much more research work is indicated by the possibilities.

Acknowledgments

It is a pleasure to acknowledge the technical assistance and suggestions of W. E. Hutton, W. D. Rosenfeld, F. D. Sisler, D. M. Updegraff, Helen H. Whelply, and Jean S. ZoBell. Members of the A.P.I. Advisory and Receiving Committees have also made important contributions.

Carl A. Young was instrumental in securing U. S. Patent No. 2,413,278 covering the bacteriological process for recovering oil, which has been dedicated to the public without charge in compliance with the policy of the American Petroleum Institute and University of California. The Pennsylvania Grade Crude Oil Association also made important contributions to the study of the problem which helped to secure patent protection for the public. The support and cooperation of members of its research committee, including Dr. Richard V. Hughes, director of production research, is also acknowledged.

Thank you, Leonard !

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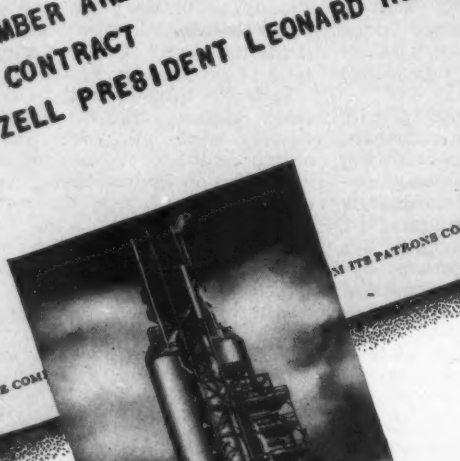

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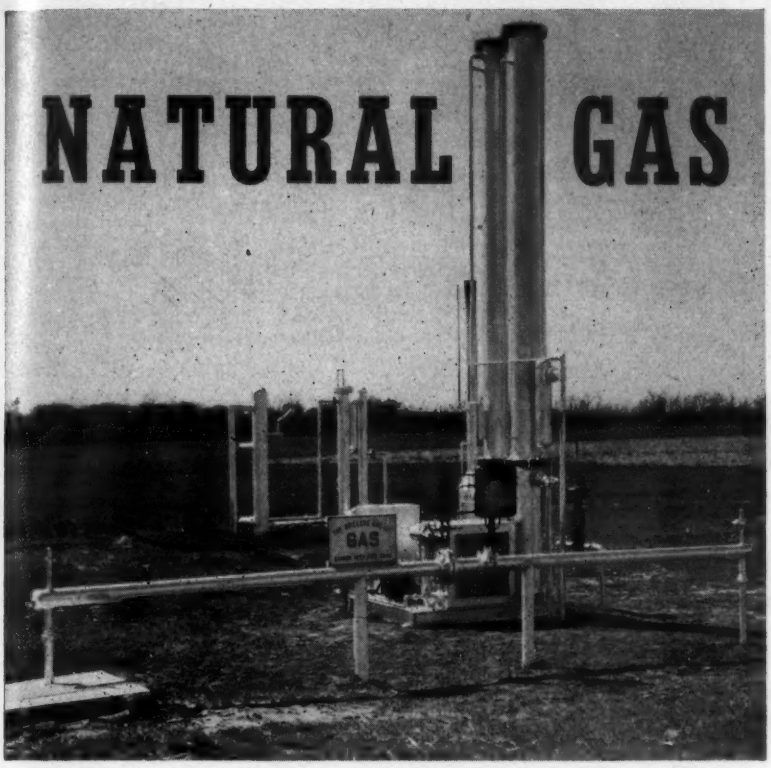
Purification of NATURAL GAS at Well Head

by R. A. Graff*



Well-head gas-desulfurizing unit operating in W½ NE¼ 2-20s-8w, Rice County, Kansas, for Drillers Gas Co., of Wichita

FOR many years, the economical production of hydrogen sulfide-bearing natural gas has been limited to the gas fields where sufficient sour-gas producing wells could be unitized and flowed into a common gathering system to be desulfurized at a central gas-purification plant. Such a system is desirable because such utilities as steam, cooling water, and electric power could be economically made available, and a source of operating labor could be maintained on a 24-hour-per-day basis

As an alternate to this procedure, the installation of small automatic self-contained gas-fired and air-cooled units have been considered where the quantity of sour gas available does not justify the construction of a central gas-purification plant. Such a unit should be suitable for use in conjunction with a single gas well, and allow the purified gas to discharge directly into the main transmission line. Another requirement for this type of plant is that not more than twice daily inspection should be necessary, and in the event of equipment failure, the unit should be provided with automatic shutdown features in order to prevent the discharge of sour gas into the main line.

Such units have recently been placed on the market, and will assist in the development of the many isolated sour-gas wells that heretofore have had to remain shut in.

Heretofore, labor has been one of the major items in calculating the cost of purifying sour gas, and it is conservatively estimated that the direct cost of desulfurization of a moderately sour natural gas at the well head will not exceed ½ cent per thousand standard cubic feet. Of course this value varies in relation to the treating process, and higher pressures are more favorable for the process.

Plant Installed in Few Hours

An interesting feature, and one which is well appreciated, is the extreme portability of these well-head desulfurization units. The entire unit is mounted on a common structural steel base, and the plant may be unloaded and placed in operation in a matter of only a few hours. This feature has made this plant suitable for the purification of drilling-rig fuel gas, compressor fuel gas, and other field applications.

Another application of this type of plant is for servicing with natural gas small communities that are located near sour-gas producing areas. In this type of application, the automatic shutdown feature would be eliminated, and in the event of equipment failure, sour gas would momentarily be introduced into the main line, until the operating difficulty was corrected. With reasonable daily inspection, such incidents should rarely occur.

These units employ the amine purification process, and are direct gas heated, and require no utilities other than the natural gas. Cooling is accomplished with radiator-type sections, and a common gas engine operates both the solution circulating pump and the fan servicing the cooling sections. Other than the occasional addition of monoethanolamine and water to the system, very little maintenance is required. Regeneration of the solution is accomplished by boiling the solution in a stripping column and the absorbed hydrogen sulfide is released to the atmosphere, after condensing any water vapor present in the effluent acid gas.

Quick Pay-Out Possible

The selection of plant size is usually dependent on the quantity of hydrogen sulfide and carbon dioxide present in the sour natural gas, along with the treating pressure available, and the atmospheric temperature at the plant location. All these features must be considered before the proper size may be selected. Plant costs vary on this same basis, and a cost of approximately $10 to $15 per thousand standard cubic feet per day of rated capacity is considered average. An investment writeoff of 6 months is not unusual, and makes such an installation very attractive to producers in high price gas distribution areas.

It is of interest to note that while well-head-gas desulfurization is a comparatively new procedure, well-head-gas dehydration units employing the diethylene glycol process have been in general use for several years, and in recent months, automatic well-head dehydration units, employing the solid desiccant system, have been offered. This general trend is the result of the increased scarcity of labor and the narrow margin of profit in the natural-gas industry, coupled with the application of skilled instrumentation procedures.

*Graff Engineering & Development Co., Louisville, Ky.

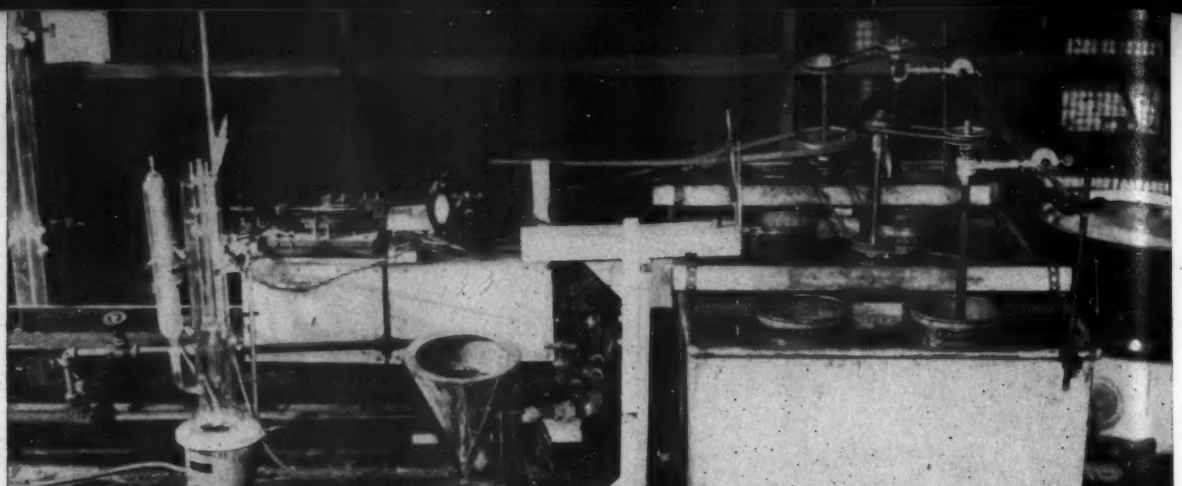


Fig. 1—Apparatus used for extractions

Stage Estimation in Lubricating Distillate Extraction

by Vernon G. Skogan* and M. C. Rogers†

THE application of liquid-liquid extractions to the processing of petroleum distillates has brought with it many new problems. The complex nature of petroleum makes it difficult, if not impossible, to treat design problems rigorously from a theoretical viewpoint.

Various writers[2,9,10,12,19,20] presented methods for the estimation of the number of equilibrium stages or units necessary to accomplish a given separation with any given solvent. In nearly all cases these methods have been derived for pure components and they can hardly be expected to apply generally to systems containing complex petroleum fractions.

A few writers[5,9,12,17] have presented solvent-extraction data, but in general these are not sufficiently complete to establish the validity of any of the design methods.

In this investigation numerous extractions have been made under single and multistage conditions and different solvent-oil ratios using two different solvents and one petroleum oil. The two solvents, chlorex (BB-dichlorethyl ether) and furfural, were commercial-grade solvents obtained from the manufacturers and possessed the properties of the material usually used for solvent extraction.

The oil used was a wax-free distillate obtained from a Winkler County, Texas, crude and had the following properties:

Viscosity index—42.5.

Viscosity gravity constant—0.876.

Saybolt Universal viscosity at 100 = 2,467.7 seconds.

Saybolt Universal viscosity at 210 = 110.5 seconds.

A.P.I. gravity = 18.6° at 60° F.

*Present address, research laboratory, Standard Oil Co. (Ind.), Whiting. †Present address, research department, R. R. Donnelley & Sons, 350 East Twenty-second Street, Chicago. This paper is a portion of a thesis submitted in partial fulfillment for the degree of master of science at University of Minnesota.

ABSTRACT

SEVERAL methods have been proposed for the graphical estimation of the stage requirements in liquid-liquid countercurrent extractions, all based on theoretical considerations only. All have assumed that the oil can be divided into two components, paraffinic and naphthenic, which can be treated as pure compounds. Among the methods proposed is that of Hunter and Nash using triangular diagram and equilibrium data for single stage extractions.

In the current investigation this method is shown to be inapplicable to real situations. A method of adjusting the data of the diagram has been proposed, which gives good results for the data available, but it does require more fundamental laboratory data than does the Hunter and Nash method, before it can be applied.

Apparatus Used

The extractions were all carried out at constant temperatures in an apparatus illustrated in Fig. 1. This apparatus consisted of a metal tank 48 by 24 by 13 in. in which were eight cone-bottomed cylindrical copper pots 6 in. in diameter and 10 in. deep with 60° cones. The outlet from each cone extended through the tank bottoms making it possible to remove the extract layer from the bottom. Water was used as the medium in the bath, and constant temperature was maintained by resistance coils connected through a relay system to a thermoregulator.

Method of Extraction

Single-stage extraction. — Single-stage or batch extractions were carried out with both solvents. The total volume used in each batch was about 4 l., because of the limited pot capacity and the necessity for agitation. The calculated weight of oil was put

in the copper pot in the water bath and the desired volume of solvent was measured in a graduated cylinder and added to the oil.

A stirring propeller was placed in the pot and adjusted so that the agitation was very vigorous. Stirring was continued for 1 hour since this had been found by experiment to be ample time to insure attainment of equilibrium. A square tin cover with a slot cut in it for the propeller shaft was used to cover the pot to minimize the loss of solvent and oil during stirring. The stirring propeller was then disconnected, lifted out of the pot, and the slots in the tin cover were closed. The mixture was allowed to settle for at least 3 hours but usually it was left to stand overnight.

After settling, the layers were drained from the bottom of each of the mixing pots through a long glass tube into separate weighed flasks. By placing a light in a small box with a slot cut for the insertion of the glass tube the solution could be seen flowing through the tube and the layer interface be located. The extract, which was the solvent with its dissolved oil, being the most dense component, settled to the bottom of the pot and was drawn off first. The raffinate, which was the refined oil with a little dissolved solvent, was then run into another flask. The interface was usually easy to locate since the raffinate was generally darker than the extract, and a sludge or rag of intermediate density was nearly always formed between the layers and so marked the interface. This sludge seldom amounted to more than 2 or 3 g. and did not affect the results appreciably, especially since it adhered to the bottom of the sample bottle and so did not interfere with the gravity and viscosity determinations.

The two flasks containing the extract and raffinate were weighed and the solvent removed by distillation. The distillation was done in glass flasks by heating the liquid to its boiling point and continuing until sufficient solvent had been removed to raise the boiling point to 250° C. At 250° C. carbon dioxide was admitted to the liquid to effect final stripping of solvent from the oil. Carbon dioxide was passed through the hot mixture for 10 or 15 minutes after the odor of solvent had disappeared from the vapors leaving the mouth of the distilling flask. The flasks were then cooled, weighed and samples poured into bottles.

Multistage extraction.—The multistage extractions using chlorex which are included in this report are those of P. N. Fawcett;[4] those using furfural were carried out by the writers.

The system of obtaining countercurrent results by batch means as described by Rushton[17] was employed to obtain three and five-stage data. Material balances were run on each pot and the loss in weight was assumed to be all solvent (since little oil had been lost in the single-stage experiments) and that amount of solvent was added to the extract in the following cycle. By carrying on these operations until all the comparable weighings were constant, equilibrium was assumed to be attained. Some difficulty was encountered with occlusion of solvent in the sludge, which increased the weight and introduced error in the amount of solvent in the raffinate. Another difficulty was the darkening of the furfural due to oxidation and polymerization to such an extent that the interface could not be seen, even using a strong light. To overcome this difficulty it was necessary carefully to distill, and sometimes redistill, the furfural and to use it as soon as possible, usually within a day or two after distillation. When equilibrium was reached the extract and raffinate were weighed, carefully stripped of solvent, reweighed, and samples taken. The intermediate extracts and raffinates were stripped of solvent only to recover it; the oils being discarded without weighing.

The viscosities of the oils in the extract and raffinate layers were determined in a Fitzsimmons viscometer.[6] Gravities were determined according to methods of the American Society for Testing Materials.[16]

Experimental work. — Extractions were made using furfural and oil under one, three, and five-stage conditions and a wide variety of solvent-oil ratios. Data, experimental and derived, for these extractions are shown in Tables 1, 5, 8 and 9. The extractions with chlorex and oil covered approximately the same conditions as the furfural extractions and the data are shown in Tables 2, 6 and 10. Although all data have been plotted and the information in Tables 1 and 2 are taken from the plots, the information is not given graphically because of space limitations.

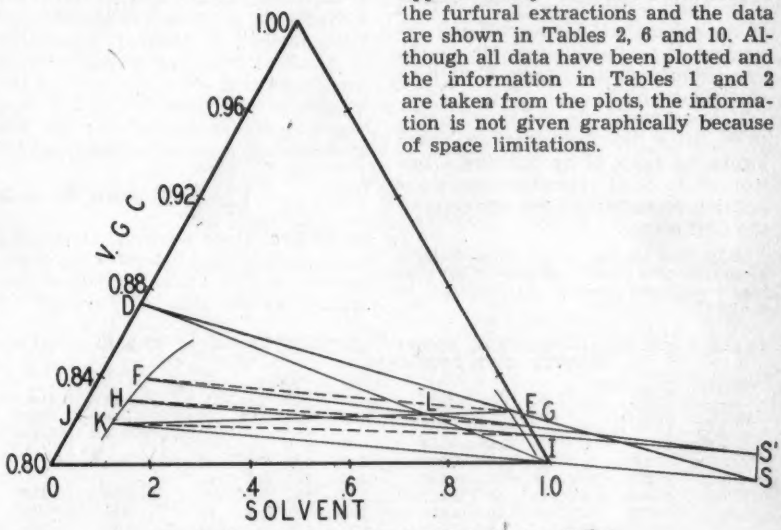


Fig. 3—Extraction of oil No. 1 with furfural at 150° F.

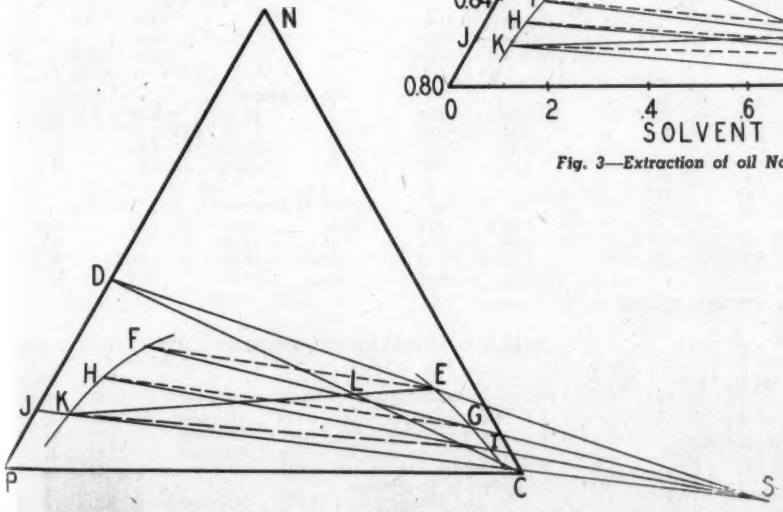


Fig. 2—Illustration of Hunter and Nash method

Discussion.—Since the method proposed for predicting the number of stages required to produce refined oils of given quality were not strictly applicable to the published data[8,10,17] or to the data from this investigation, the writer's attention was devoted to means for making them applicable. The Hunter and Nash[9] system utilizing ternary diagrams seemed to offer the most promise and the discussion here will be confined to it.

This method has been mathematically derived and is based on the assumption that the oil to be treated

is composed of two pure components, paraffines and naphthenes. With this assumption the solvent extraction process may be considered to be carried out as a ternary system with the solvent as the third component.

Fig. 2 gives an illustration of the application of the method to a general problem of extraction. the apexes P, N, and C represent pure paraffinic, naphthenic, and solvent components. However, for the sake of convenience and because it is not customary to report the analysis of an oil in terms of paraffinic or naphthenic components, these properties are expressed in terms of viscosity-gravity constant[3] V.G.C. with the low or paraffinic values of the constant starting at the apex P and the high or naphthenic values at the apex N.

The lines K-H-F and I-G-E represent composition of the raffinate and extract layers respectively plotted from single-stage extraction data, and when the proper tie lines* are drawn represent the composition of extract in equilibrium with given raffinates. If we draw a line from K through L, the point representing the composition of the oil-solvent mixture, and extend the line to meet the line I-G-E, the intersection at E represents the composition of the extract leaving a system in producing a raffinate of composition K.

Drawing a line from D, the V.G.C. of the original oil, through E and extending it to the intersection of the line through apex C from K will locate the point S.

Now construct the tie line from E to F using tie line data and then locate the point G by drawing a line from F to S. G represents the composition of extract in the stage above the first stage.

*A tie line is a line on the phase diagram connecting two points representing the conjugate solutions formed by a system in equilibrium.

A repetition of the above procedure until the point K is reached will provide a solution to the problem. In this case three equilibrium stages are needed to produce a raffinate of V.G.C. equivalent to K from a stock with V.G.C. equivalent to D.

When data from the literature and those obtained in this investigation were applied to this method, it was impossible to arrive at the theoretical results. The properties of the raffinate obtained from multistage extractions never coincided with those predicted from the single-stage equilibrium data on the ternary diagram using the Hunter and Nash procedure.

Qualitative study of the data on furfural extraction, Tables 5, 8, and 9, and the diagrams constructed from them showed that in all cases, the point S, as usually plotted, was too low and that if this point were to be raised, the experimental and theoretical results could be made to coincide. All of the experimental data of this investigation were plotted and the point S raised to S^1, (Fig. 3) so that the theoretical stages required and the actual stages used would coincide when the various lines were drawn to meet at S^1 instead of S.

When this was done it was found that for any given number of stages the relationship between the lengths of the lines DE, ES, and SS^1 provided a means for altering the Hunter and Nash method to make it applicable to practical problems. Specifically, it was found that when the ratio of the lengths of the lines ES to SS^1 was added to the length of the line DE an essentially constant value resulted,

i.e. $\left(\frac{ES}{SS^1} + DE\right) = \text{constant}$. The data on furfural alone were not conclusive because they were not sufficiently extensive, so the same procedure was applied to the data of Fawcett[4] on chlorex-oil extraction (Tables 6 and 10). Here the agreement as to constancy was even more pronounced. This is illustrated in Tables 1 and 2. Since the amount of elevation of point S^1 above S is dependent on the slope of the lines and these are in turn dependent on the raw oil and solvent used, the constant can be estimated only after at least one set of experimental data is obtained for the oil and solvent studied using the number of stages desired.

Published data on extraction are not sufficiently complete to make application of this process to all of them, excepting in a few cases. Ferris, Berkhimer, and Henderson[5] report single-stage data for the same oil (No. 3) on which Hunter and Nash[10,22] made three-stage extraction runs (Table 7). The data were not all given in the proper range to make accurate tie line estimations, but the agreement in the region where data were available is quite good as is shown by the constant value of the sum of $\left(\frac{ES}{SS^1} + DE\right)$ in Table 3. Rushton[17] gives data on another oil (No. 2), Table 7, but in this case the constant, Table 3, does not appear to be constant, probably because of insufficient data on the single-stage extraction to provide good tie line information.

On the basis of the above work it should be possible to make fairly good estimation of the quality of the oil which can be produced by any given number of stages of countercurrent extraction. It is necessary, however, that rather complete data on single-stage extractions be available to establish the equilibrium curve and tie lines and that one extraction using the desired number of stages be made with any solvent-oil ratio. When these data are available the point S^1 can be located and the quality of raffinate

TABLE 1—OIL NO. 1—(WINKLER COUNTY DISTILLATE)—EXTRACTED WITH FURFURAL

Vol. solv. / Vol. oil	Elevation* (SS^1) in cm.	ES* cm.	DE* cm.	ES / Elev.	ES / Elev. + DE
		No. of Stages—3			
3	1.09	8.27	18.30	7.58	25.9
5	0.38	4.30	18.85	7.42	26.3
7	0.46	3.00	19.10	6.52	25.6
9	0.36	2.35	19.25	6.55	25.8
		No. of Stages—5			
3	0.80	8.05	18.30	10.05	28.3
5	0.50	4.35	18.85	8.70	27.5
7	0.40	2.95	19.10	7.40	†26.5

*These lengths are obtained when the data are plotted on an equilateral triangle with 20 cm. altitude. †Insufficient tie line data.

TABLE 2—OIL NO. 1—(WINKLER COUNTY DISTILLATE)—EXTRACTED WITH CHLOREX

Vol. solv. / Vol. oil	Elevation (SS^1) in cm.	ES cm.	DE cm.	ES / Elev.	ES / Elev. + DE
		No. of Stages—2			
1.90	1.37	13.10	16.00	9.55	25.5
2.84	0.96	7.65	16.90	8.00	24.9
3.77	0.64	5.45	17.45	8.42	25.9
4.73	0.59	4.15	17.85	7.05	24.9
		No. of Stages—3			
1.92	1.25	12.10	15.85	9.68	25.5
2.89	0.94	7.30	16.85	7.77	24.6
4.09	0.73	4.90	17.55	6.71	24.2
5.04	0.63	4.00	17.90	6.35	24.2

TABLE 3—OIL NO. 2—EXTRACTED WITH NITROBENZENE
Two Stages—Rushton Data

Vol. solv. / Vol. oil	Elevation (SS^1) in cm.	ES cm.	DE cm.	ES / Elev.	ES / Elev. + DE
2	1.20	11.30	16.05	9.42	25.5
3	0.91	6.40	16.65	7.04	*23.7

OIL NO. 3—EXTRACTED WITH NITROBENZENE
Three Stages—Hunter and Nash Data

1.00	1.85	32.3	13.25	17.5	30.7
1.364	1.05	17.5	14.3	16.7	31.0

*Insufficient tie line data.

TABLE 4—SUMMARY OF SOLVENT EXTRACTION DATA

Oil No.	Investigators	V.G.C. stock	Solvent	Temp., °F.	No. of stages
1	Skogan	0.876	Furfural	150	1, 3, 5
1	Skogan	0.876	Chlorex	80	1
1	Fawcett	0.876	Chlorex	80	1, 2, 3
2	Rushton	0.850	Nitrobenzene	50	1, 2
3	Ferris, Berkhimer and Henderson	0.853	Nitrobenzene	50	1
3	Hunter and Nash	0.853	Nitrobenzene	50	3

estimated for any solvent-oil ratio.

Conclusions

The work of this investigation shows that the theoretical derivation for estimating the number of equilibrium stages required to produce a refined oil of given quality cannot be applied directly to actual problems without making some empirical adjustments.

In the case of the Hunter and Nash method, it can be made applicable to problems of design if single-stage data for a wide range of solvent-oil ratios are known and, in addition, multistage data for at least one oil-solvent ratio on any given oil and solvent and number of stages are determined.

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TABLE 5—OIL NO. 1—EXTRACTED WITH FURFURAL

Exp. No.	Vol. solv. / Vol. oil	V.G.C. raff. (solvent free)	Per cent solv. in raff.	V.G.C. ext.	Per cent solv. in ext.
		No. of Stages—1			
11	4	0.833	6.4	0.977	92.4
12	8	0.822	5.4	....	...
13	12	0.817	5.4	....	...
14	3	0.836	8.3	....	...
15	5	0.829	6.7	....	93.0
16	7	0.824	6.2	0.964	94.2
17	10	0.819	7.3	....	...
18	3	0.835	10.1	0.979	90.6
19	1	0.852	10.5	0.998	83.3
20	5	0.827	2.4	0.966	92.7
21	7	0.823	4.5	0.960	94.4
22	9	0.820	6.0	0.956	95.3
24	20	0.809	7.1	0.932	96.8
25	12	0.815	11.1	0.952	96.0
26	15	0.812	13.3	0.945	96.6
		No. of Stages—3			
	3	0.823	6.3	0.979	89.2
	5	0.814	5.9	0.969	91.9
	7	0.810	4.2	0.959	93.8
	9	0.808	1.1	0.046	94.2
		No. of Stages—5			
	3	0.818	7.5	0.979	87.9
	5	0.810	4.6	0.969	90.7
	7	0.807	7.3	0.950	92.4

TABLE 7—NITROBENZENE
Data from Rushton; Ferris, Berkhimer, Henderson; and Hunter and Nash

Oil No.	Vol. solv. / Vol. oil	V.G.C. raff.	Per cent solv. in raff.	V.G.C. ext.	Per cent solv. in ext.	Reference
			No. of Stages—1			
2	0.5	0.844	19.8	0.897	71.4	17
	1.0	0.834	17.1	0.893	75.8	
	1.5	0.827	15.5	0.889	79.0	
	2.0	0.822	13.2	0.884	81.1	
	3.0	0.815	12.8	0.875	83.5	
			No. of Stages—2			
	2.0	0.814	13.7	0.887	79.3	
	3.0	0.808	12.7	0.878	81.2	
			No. of Stages—1			
3	0.5	0.842	20.6	0.899	58.4	5
	1.0	0.830	17.4	0.894	70.2	
	3.0	0.815	12.5	0.880	84.4	
	5.0	0.807	12.7	0.868	86.7	
			No. of Stages—3			
	1.0	0.811	12.5	0.895	64.8	10
	1.36	0.807	10.8	0.889	70.1	

TABLE 9—OIL NO. 1—EXTRACTED WITH FURFURAL

Solv. oil	A.P.I. raff.	A.P.I. ext.	V.I. raff.	Per cent yield raff.	Raff.* 210 visc., cs.	Raff. 100 visc., cs.	Raff. 210 visc., cs.
			No. of Stages—3				
3	26.0	4.9	81.5	61.6	16.47	226.0	97.3
5	27.3	6.2	86.8	55.8	15.90	203.5	82.4
7	27.8	7.5	89.9	52.4	16.08	198.8	69.2
9	28.2	9.0	92.9	47.4	15.36	182.0	62.7
			No. of Stages—5				
3	26.8	4.6	83.6	60.7	16.10	213.5	127.8
5	27.9	5.7	89.8	52.4	15.42	188.3	117.8
7	28.4	8.4	91.7	51.3	15.14	180.5	70.2

*Conversion table for centistokes (cs.) and S.U.V., Reference 15.

TABLE 6—OIL NO. 1—EXTRACTED WITH CHLOREX

Exp. No.	Vol. solv. / Vol. oil	V.G.C. raff. (solvent free)	Per cent solv. in raff.	V.G.C. ext.	Per cent solv. in ext.
		No. of Stages—1			
	1.88	0.837	18.8	0.941	82.3
	2.82	0.830	17.4	0.936	86.1
	3.78	0.825	16.2	0.932	88.3
	4.73	...	15.8	0.927	89.8
11	1	0.850	21.0	0.945	75.0
15	5	0.818	....	....	89.7
16	9	0.808	(18.5)	0.907	93.3
17	15	0.801	(24.6)	0.895	94.8
18	20	0.797	(25.2)	0.888	95.8
		No. of Stages—2			
	1.90	0.823	15.5	0.939	79.6
	2.84	0.815	13.9	0.934	84.2
	3.77	0.809	13.5	0.929	86.7
	4.73	0.806	13.8	0.925	88.6
		No. of Stages—3			
	1.92	0.815	13.3	0.937	78.7
	2.89	0.809	12.9	0.930	83.8
	4.09	0.804	15.7	0.926	86.9
	5.04	0.800	12.5	0.922	88.7

The figures in parentheses are very difficult to obtain correctly and in this case are known to be wrong. Therefore these points are projected on the raffinate curve, which can be drawn with very little error using the stage data.

All of the above data, except those designated by an experiment number, were secured from P. N. Fawcett.

TABLE 8—OIL NO. 1—EXTRACTED WITH FURFURAL—SINGLE STAGE

Exp. No.	A.P.I. raff.	A.P.I. ext.	V.I. raff.	Per cent yield raff.	Raff.* 210 visc., cs.	Raff. 100 visc., cs.	Raff. 210 visc., cs.
11	24.6	5.2	77.8	67.5	17.55	259.5	97.4
12	26.1	...	82.6	57.0	16.37	221.5	...
13	27.0	7.8	85.8	50.2	15.70	201.5	...
14	24.1	...	67.5	70.5	17.80	279.0	...
15	25.2	6.3	77.2	63.9	16.92	245.3	...
16	25.9	7.1	81.8	58.9	16.55	228.0	...
17	26.6	...	84.5	53.0	16.05	210.7	...
18	24.1	4.6	71.3	68.7	17.80	277.0	126.7
19	21.9	2.5	59.1	81.3	19.55	361.0	149.3
20	25.4	6.5	78.8	82.9	17.10	246.0	87.6
21	25.9	7.2	82.1	57.0	16.60	228.0	79.9
22	26.5	7.7	81.0	53.8	16.45	226.5	75.0
24	28.1	10.6	95.7	42.3	15.20	187.4	54.7
25	27.1	7.9	88.2	50.5	16.24	208.0	91.9
26	27.5	9.1	89.4	46.0	16.02	201.0	66.1

*Conversion table for centistokes (cs.) and S.U.V., Reference 15.

TABLE 10—OIL NO. 1—EXTRACTED WITH CHLOREX
Single Stage

Exp. No.	A.P.I. raff.	A.P.I. ext.	V.I. raff.	Per cent yield raff.	Raff.* 210 visc., cs.	Raff. 100 visc., cs.	Raff. 210 visc., cs.
11	22.2	9.3	66.8	71.0	19.10	327.0	51.35
15	26.8	12.3	86.4	41.7	15.96	206.0	42.1
16	28.2	14.0	94.4	29.5	15.74	186.5	36.0
17	29.2	15.6	97.0	17.8	15.58	178.5	33.4
18	29.5	16.4	98.7	10.3	16.03	183.0	31.15

*Conversion table for centistokes (cs.) and S.U.V., Reference 15.

Determination of POTASH in Brines and Cuttings

by

W. A. Cunningham*

OPERATORS in those regions of Texas, Louisiana, and New Mexico in which salt deposits are encountered frequently would like to know whether or not the formations through which they are drilling contain any potash salts. Insoluble potash minerals, such as polyhalite and langbeinite, usually can be identified in the cuttings by microscopic examination, but chemical analysis is sometimes necessary to distinguish these minerals from other minerals, particularly anhydrite. The soluble minerals, such as sylvinite, may not appear at all in the cuttings, thus making chemical analysis of the brine essential if the presence of soluble potash is to be established.

Since very few geological offices have a complete chemical laboratory available, the determination of the potassium content of the brine or of the cuttings by rigorous chemical methods, such as the chloroplatinic acid or perchloric acid method, is out of the question. Indeed, the nature of the samples themselves does not warrant the use of analytical methods of extreme accuracy.

A modified cobalti-nitrite method of potassium analysis presented here is sufficiently accurate to serve the specific needs outlined above. Such a method was developed several years ago in the bureau of industrial chemistry of University of Texas, and was used by the author in making some 1,200 analyses of brines and cuttings from the Permian basin of West Texas. Briefly, it involves the precipitation of the potassium as the cobalti-nitrite, and comparing the volume of the precipitate with that from a known amount of potassium.

Details of the method are as follows:

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A. Cuttings.

1. Pour a small portion of the sample into a mortar and crush finely.

2. Weigh out an accurate 1-g. sample and put into a 250-cc. beaker containing about 50 cc. distilled water. (See note **a.**)

3. Add 10 cc. of a 10 per cent sodium carbonate solution and boil for 30 minutes. Add water as required to keep at least 50 cc. in the beaker. Polyhalite and other potash salts are completely decomposed by this treatment and the potassium goes into solution.

4. Filter and wash with hot water.

5. Make filtrate slightly acid to litmus with a few drops of glacial acetic acid and evaporate to 25-35 cc. **Caution:** Do not carry the evaporation so far that crystals will form when the liquor cools. (See note **b.**)

6. Transfer to precipitation tube (see note **c**), make total volume up to 50 cc., add 15 cc. cobalti-nitrite reagent (see note **d**), shake well, and let set 30 minutes before reading. In case some of the precipitate sticks to the side of the tube it may be loosened by rotating the tube.

7. A "standard" amount of potassium should be precipitated at the same time for comparison of the volumes of precipitate obtained. To do this, add 5 cc. of standard potassium sulfate solution to a precipitation tube, make the total volume up to 50 cc., and add the cobalti-nitrite as described in **6.** The standard potash solution is made by dissolving 3 g. potassium sulfate in enough water to make 100 cc. of solution: 5 cc. of this solution contain 0.15 g. K_2SO_4 or 0.081 g. K_2O, and normally yields a precipitate of about 0.3 cc. of potassium cobalti-nitrite. Inasmuch as temperature, volume of solution, amount of reagent, etc., affect the rate and extent of the settling of the precipitate, a standard tube should be prepared each time analyses are made. (See note **c.**)

Notes.

(a) The sample should be weighed on a chemical balance, but a good platform balance can be used for qualitative and semi-quantitative analyses.

(b) If crystals form upon cooling, sufficient distilled water should be added to dissolve all the crystals.

(c) The precipitation tube used is the standard 100 cc. water and sediment tubes used in A.S.T.M. Standard Method D96-40. Pyrex glass tubes of this design are preferred since they tend to be more uniform. It is highly important that these tubes be kept scrupulously clean; they should be washed with a good scouring powder or with chromic acid immediately preceding each determination.

(d) Cobalti-nitrite reagent is prepared as follows:

Solution A:

113 g. cobaltous acetate
100 cc. glacial acetic acid
water to make up to 500 cc.

Solution B:

200 g. sodium nitrite
water to make up to 500 cc.

Mix equal volumes of the solutions A and B and keep under vacuum overnight to remove gasses formed. The mixture should be kept in an amber bottle and not used after it is 2 weeks old. Small amounts of the reagent may be prepared for immediate use without subjecting it to the vacuum treatment.

(e) The volume of the precipitate should never be over 0.4 cc. If the 1 g. sample yields a larger amount, the determination should be repeated with a sample of only 0.5 g. The amount of potash in the sample can be calculated as follows:

$$\text{Per cent } K_2O = \frac{\text{Vol. of precipitate in unknown}}{\text{Vol. of precipitate in standard}} \times \frac{0.0811}{\text{wgt. sample}} \times 100$$

$$\text{Per cent } K_2SO_4 = \text{per cent } K_2O \times 1.841$$

$$\text{Per cent KCl} = \text{per cent } K_2O \times 1.585$$

B. Brines.

1. Allow the sample to set overnight if possible and then filter off a perfectly clear portion of about 50 cc.

2. Measure accurately three portions of the brine, one of 5 cc., one of 10 cc., and one of 15 cc., into as many precipitation tubes, dilute each to 50 cc. with distilled water, and precipitate with cobalti-nitrite reagent in the usual manner. Compare the volume of precipitate with that of a standard prepared at the same time.

In event the volume of precipitate from the 5-cc. sample exceeds 0.4 cc., a second series of precipitations must be made with 1, 2, and 3-cc. samples.

3. The amount of potash present in the brine can be calculated as follows:

$$\text{Grams } K_2O \text{ per 100 cc.} = \frac{\text{Vol. of precipitate in unknown}}{\text{Vol. of precipitate in standard}} \times 0.0811$$

$$\text{Grams } K_2SO_4 \text{ per 100 cc.} = \text{Grams } K_2O \times 1.841$$

$$\text{Grams KCl per 100 cc.} = \text{Grams } K_2O \times 1.585$$

4. If the amount of potash is desired in terms of per cent, it will be necessary to determine the specific gravity by means of a hydrometer or by weighing known volume of brine.

$$\text{Per cent} = \frac{\text{Grams potash salt per 100 cc.}}{100 \times \text{Density}} \times 100.$$

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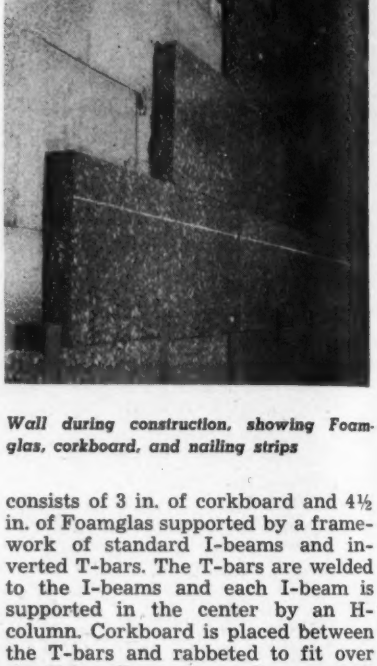
Features of New Cold Storage And Blending Laboratory

A VALUABLE accessory of a modern petroleum laboratory is a low-temperature room where light hydrocarbon materials can be stored and handled without appreciable loss and where special low-temperature tests can be conducted. General building features of this type of cold-storage and blending laboratory constructed for the U. S. Bureau of Mines petroleum experiment station at Bartlesville, Okla., are described here.

The building is divided into four rooms; two compressor rooms, an office, and the storage and blending laboratory. The larger compressor room contains a 7.5-ton compressor and heat exchanger to refrigerate water for condensers of the fractionating columns in an adjacent building. The smaller compressor room contains a 25-ton unit for chilling the freezing showers in the blending laboratory. A 4-in. reinforced subfloor, a 4½-in. layer of Foamglas, a 2-in. layer of corkboard, and a 4-in. reinforced-concrete wearing surface comprise the floor. The concrete subfloor and each layer of insulation were flooded with hot asphalt before application of the next layer to give a good seal.

The walls have a 2-in. thickness of corkboard and a 4½-in. thickness of Foamglas laid on an asphaltic priming paint on the plastered brick wall. The insulation blocks were dipped and the joints were broken to give a good seal. Wainscoting of ½-in. pressed asphalt planks extends to a height of 4 ft. to protect the insulation. They are nailed to 2 by 2-in. vertical wood strips cemented into the cork insulation. Ceiling insulation consists of 3 in. of corkboard and 4½ in. of Foamglas supported by a framework of standard I-beams and inverted T-bars. The T-bars are welded to the I-beams and each I-beam is supported in the center by an H-column. Corkboard is placed between the T-bars and rabbeted to fit over the T-bar flanges to make a smooth ceiling. The Foamglas is laid in hot asphalt with the long dimension running parallel to the T-bars and with the centers of units directly over the stems of the T-bar purlins. The Foamglas is covered with 5-ply roofing composed of three layers of 15-lb. felt and two layers of 30-lb. felt. Each layer is mopped with hot asphalt and the top layer mopped with asphalt and covered with sand.



Wall during construction, showing Foamglas, corkboard, and nailing strips

Top: Installation of ceiling installation. Bottom: Interior view showing shelves, drum racks, and freezing shower

Two Doors to Cold Room

There are two doors from the office to the cold room and a door diagonally opposite which opens outside. The small "look" door has a wooden frame and three units of thermopane glass, each unit being composed of two panes of glass with a ¼-in. hermetically sealed dead-air space between them. This affords good insulation and permits observation of the laboratory working area from the office without opening the door. The outside and office passage doors are Jamison Sharp Freezer type fitted on 8-in. 11.5-lb. door bucks placed in the masonry. Insulation at all door openings is protected by corner irons with welded anchors. Walls, wainscoting, and ceiling, including the T-bar flanges, are covered with two ⅛-in. coats of asphalt emulsion. All interior surfaces are painted with aluminum paint to improve illumination.

The refrigeration system consists of a compressor with F-12 as refrig-

erant, two Kramer LW 440 freezing showers, and automatic temperature controls. The compressor is a water-cooled four-cylinder vertical reciprocal type powered by a 25-hp., high-torque, low-starting-current motor. Each of the four fans on the freezing shower is powered by a 1/6-hp. explosionproof motor. Switches and controls for the compressor and freezing showers are mounted on a common panel in the compressor room. Water lines, drains, and valves used when defrosting the freezing showers also are in the compressor room.

Shelves are provided for storage of small samples and drum racks for drum quantities. A drum hoist is mounted in a standard I-beam for moving drums in the storage room.

The blending laboratory is designed for operation at temperatures from room to 0° F. Nature of the work now in progress requires a temperature of about 35° to 40° F., however, in a test temperature was reduced to —12° F. with no difficulty. When the unit is set for 38° F., ±2°, and the ambient temperature is 75°-85° F., the temperature fluctuates on a 30-minute cycle. The temperature is reduced from 40° to 36° F. in about 5 minutes and about 25 minutes are required to warm up to 40° F.

Rolling Heavy Rigs On Wheels

(Continued from page 59)

much equipment which was left in place on the derrick floor and engine substructure. As a result, the contractor estimates a saving of 2 days in spudding in the new location.

Moving Equipment

The new rig-moving equipment features four, four-wheeled dollies placed under derrick corners or engine-unit supports. At present, wheels made for the Army's C-47 transport plane are used. Measuring 45 in. in diameter, the 17.00 by 16, rib-type, 10-ply tires are rated for a capacity load of 30,000 lb. each. As shown in Fig. 2, each wheeled unit is equipped with a horizontal circular plate which supports the load. This seat revolves freely on the unit, allowing the wheels to be directed right of left to guide the rig in movement.

An ordinary derrick can be turned 90° in about 50 ft. of travel by cutting front and rear units in opposite directions to the limit allowed by the substructure clearance. An average travel rate approaching 3 m.p.h. has been reached with some loads. In the case of the rig pictured here, actual movement was much slower.

A heavy skid plate between the dual wheels of each unit has a ground clearance without load of about 6 in. Under load, the tires, inflated to 55 psi., flatten slightly, further reducing plate clearance. This feature provides sufficient safeguard against overturning a load in case of tire failure. While experimenting with the device in South Texas, the operator purposely punctured both outside dual tires on a dolly with a derrick loaded. The derrick corner settled only a few inches to the skid plates without endangering its balance and insurance underwriters, satisfied with the test, have isued full coverage to the operation.

A rig is loaded by one of two methods. The wheeled units may be moved into place under support sills with tires deflated and the load lifted into carrying position by inflating the tires. Or, sills may be jacked to a height which will allow the units to be placed in position with tires inflated to normal pressure. The latter method was used in the Wheeler field operation (Fig. 3). As soon as a unit is properly placed, side plates are bolted to it, and secured to the sides of the sills by means of long bolts top and bottom. (Fig. 4.) Each corner of the load is guided manually. A ratchet lever turns a worm gear, rotating a horizontal toothed wheel which directs the wheels by means of a chain drive and cables attached to the axles.

Motive power required for a move depends on the load and terrain. In this case the derrick was winched from location by a truck and D-6 tractor in tandem, and the two prime movers sufficed to move it most of the distance to the new location. (Fig. 5.) Heavy squeeze sills were placed between the main support sills to prevent buckling of the derrick substructure by the converging pull of tow lines from the truck. The total derrick load, including all derrick-floor equipment excepting a dog house, was estimated at 220,000 lb. Considerably more than half this load was supported by the two dollies on the draw-works corners of the derrick. As a result, the four tires on each unit partially flattened and sank in soft sand until the skid plates rested on the ground. (Fig. 6.) This added to the force required to move the load, but did not prevent movement. Once away from soft spots in the old location, the derrick moved readily, towed by truck and tractor. A previous moving job in the sand hills of Crane County was accomplished with all skid plates touching ground and carrying a fraction of the load.

Kelly Brothers, experienced rig builders, plan several improvements in their patented equipment. B-29 wheels, with tires 60 in. in diameter and capable of supporting 60,000 lb. each, are to be substituted in future wheel units, increasing rated tire capacity of four units from 240 to 400 tons. The new dollies may comprise a cradle device which will support sills under the axle, reducing pickup distance and allowing a continuous axle assembly. This, and other improvements are expected to reduce moving time.

By mid-July a total of six derricks and rigs had been moved in this manner. The first operation followed experimental work on the King Ranch of South Texas. Contracts at Dickinson, near Houston, and in South Louisiana near Lake Charles followed before the crew came to West Texas. There, rigs were moved to new locations at Crane and Goldsmith, with the Wheeler move involving one of the heaviest loads yet attempted. Further work will continue in the Permian basin.

"Phantom Pumper"

(Continued from page 61)

lamp shows completion of the operation. Next, a tank is chosen to receive the oil and the tank switch flipped to the on position. A green light indicates that energy has been applied to the tank valve and a white light indicates tank valve has responded. The tank is now ready to receive oil. The next operation is to choose a well or wells to flow into the tank and turn the well switch or switches to the on position. Again a green light indicates demand and a white light response.

To close a well, the well switch is turned to the "off" position and the green light goes off immediately, indicating that the energy has been removed from the well valve. As soon as the valve is in the closed position, the white light goes off. To close a tank, the tank switch is turned off and the green and white lights above the tank switch perform in the same manner as for the well switch.

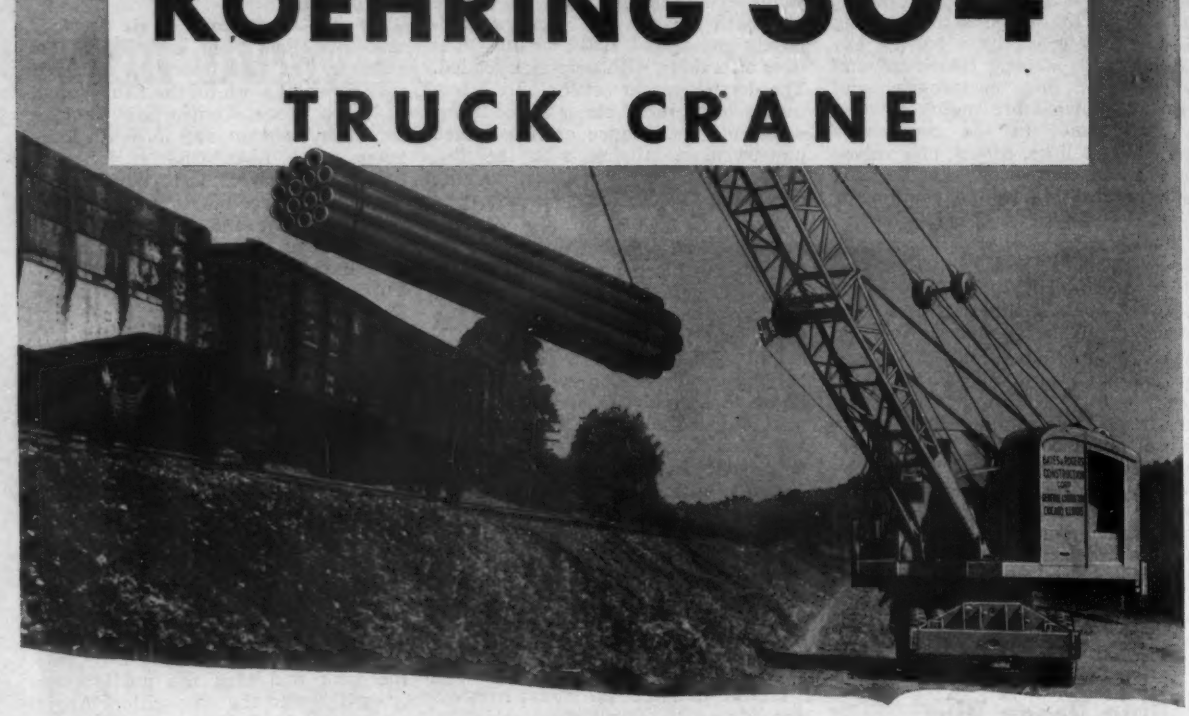
A number of safety features are incorporated in the operation of the main control panel to prevent mishaps or loss of oil. These features include the following:

1. No well can be opened unless there is a tank open to receive the oil.
2. Tank valves, even though closed, automatically "pop" into tank in case of excessive line pressure.
3. Wells are automatically closed by power failure or line failure to tank.
4. In case of line failure, all operations are resumed as soon as power is reapplied.
5. All lines are fused for protection in case of a short in the circuit.
6. When a tank becomes full, the wells flowing into that tank are shut down automatically.

Although not used in this installation, it is possible to provide automatic stock-tank switching through the control panel. When one tank be-

(Continued on page 85)

KOEHRING 304
TRUCK CRANE



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Crawlers: 13,800 lbs.
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Koehring 605 Shovel Capacity — 1½ yard
Crane Lifting Capacity:
Crawlers: 60,760 lbs.

Crawlers: 75% Rating
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HEAVY-DUTY CONSTRUCTION EQUIPMENT

came full, production would automatically start into another predetermined tank. In case this tank was full or being run to pipe line, an empty tank would be found and production switched to it, or if none were available, production would be shut in. Indicator lamps on the central control panel would indicate change of operation. This would, of course, make it possible for a pumper to visit the lease at less-frequent intervals.

Well-energizing relays have been placed in such a way that no energy can be supplied to the well circuits until the tank valve has opened. This insures a receiver for the production. The dual counters which record the lease production are of the key-reset type. The tank liquid-level indicating meters are calibrated in feet and inches. A strapping table is posted adjacent to the meters for immediate conversion of the meter reading to barrels.

The control equipment operated from the central panel can best be understood by breaking it down into three groups—equipment at the well head, the tanks, and at the separator.

Well-Head Equipment

Heart of the control system at the well head (see Fig. 2) is a gas diaphragm-operated valve which controls the flow of oil. On this lease, a 2-in., 1,000-psi. and a 2-in., 2,000-psi. B.S.&B. standard oil valves are used. These gas-operated valves are bypassed by a hand-operated valve to be used in case of emergency. A Mercoid switch, mechanically connected to the valve stem, is in series with the response lamp in the control panel to show the open and closed position of the valve.

Gas to operate the oil valves is obtained from the flow line by means of a 2-in. by 3-ft. riser, as these wells are dual completions. In the case of single-completion wells, the gas could be taken from the annulus. A high-pressure and a low-pressure drip pot are used to dry the gas and a pressure regulator is installed between the pots. A three-way electrically operated 15-watt gas valve controls the supply of gas to the diaphragm of the oil valve. Application of gas to the oil valve diaphragm opens the valve and the gas is vented to the atmosphere upon closing.

Current to operate the three-way gas valve is brought to within about 100 ft. of the well head by No. 12 bare wire strung on poles. In the vicinity of the well head the lines are buried in conduit to prevent damage from workmen or falling equipment around the well. The circuit is grounded through the flow line. A relay operated by current to the tanks allows well circuit to be closed only after a tank is open to receive the oil.

At the stock tanks (see Fig. 3), a 4-in. gas diaphragm-operated pressure closing valve incorporated in a 4-in. crosscontrols the flow of production into the tank. Gas for this valve is furnished through a three-way electrically operated gas valve. The application of gas to the oil valve diaphragm closes this valve which is the reverse operation to that of the oil valves at the well head. At the request of the pipe-line company running the oil, a mechanically operated valve is in the line below the gas-operated valve. The pipe-line company gager can thus close the flow line manually while the tank is being run.

The electrical system requires four insulated No. 12 wires to each tank plus the ground return which is through the flow line. One line runs from the three-way gas valve to a manual switch and fuse on the central control panel. Between the fuse and three-way gas valve is a Mercoid float-operated switch which closes the tank valve at a predetermined top level in the tank.

Liquid-level gaging is done by a liquid-level meter body (see Fig. 4) which is connected to an indicator on the central control panel. In tests conducted last winter, the gaging done by the liquid-level meter was within ¼-in. of hand gaging. A greater discrepancy has been noted during the summer months. This is believed due to the fact that the meter is painted black and is exposed to the sun and steps are being taken to protect the meter.

In series with the electrical circuit is a relay which on closing allows wells to be energized only after the tank valve has opened. A Mercoid switch is mechanically connected to the valve stem of the tank-oil valve to indicate the open or closed position on the control panel. The gas supply for the operation of the tank-oil valve is from the lease separator through drying tubes and a pressure regulator to the three-way gas valve.

Separator Equipment

Lease production information is obtained by means of a B.S.&B. oil meter set under a 3 by 11-ft. separator. (See Fig. 5.) This oil meter is actually a gaging tank designed to operate at separator pressures up to 125 psi.; this pressure is maintained on the meter chamber by means of an equalizer line connected to the separator vent-gas line. Within the chamber, a large, buoyant float is suspended from a ball-bearing-mounted trunnion shaft which actuates a three-way metering valve.

By determining the shrinkage of the produced oil between the separator and the stock tank, the meter can be calibrated in terms of stock-tank oil. When the meter chamber fills to the level which has been determined by calibration, the positive pressure exerted by the float arm trips the primary valve, closing inlet port of the three-way metering valve and opening the outlet port, instantaneously. This valve action also trips a sealed counter which records 1 bbl. of oil delivered to the stock tanks. When the oil level has fallen to the required point, the float arm trips the other primary valve, causing the outlet port to close and the inlet port to open; admitting another barrel of oil to the chamber for measurement. A Mercoid switch is mechanically connected to the metering chamber valve and indicates, on the central control panel, the number of dumps (barrels) of oil delivered to the stock tanks.

Economics

Electric power and gas requirements for operation of the remote well and tank-control system are so small as to be of no consequence. The opening and closing of the gas-operated valves requires from 50-70 cu. in. of gas for one cycle. Estimated power requirement for the entire 115-volt a.c. system is 85 watts.

BOOKS

TENTATIVE STANDARD PROCEDURE FOR THE DETERMINATION OF SUPER-EXPANSIBILITY AND MANOMETER FACTORS USED IN MEASUREMENT OF NATURAL GAS BY ORIFICE METERS AT PRESSURES IN EXCESS OF 500 PSIG. Published by California Natural Gasoline Association, Los Angeles.

This publication, TS-461, was prepared under the direction of E. P. Valby, chairman of the technical committee, and a joint committee consisting of the C.N.G.A., Pacific Coast Gas Association, and the Southern California Meter Association, to supplement Bulletins TS-353, TS-354, and TS-402. It is felt that this bulletin will fulfill the need for supplemental superexpansibility factors and manometer factors created by the advent of metering installations measuring gas at pressures in excess of 500 psig.

HYDRAULIC EQUIPMENT. Published by Shell Oil Co., Inc., 50 West 50th Street, New York. 44 pp.

The increasing use of oil-hydraulic power in all branches of industry led recently to the publication of this booklet, which was prepared under the direction of Shell's lubricants division. Its simple yet comprehensive review of hydraulic principles should add to the general understanding of this growing field. The booklet includes chapters on hydraulic principles, systems and equipment, oil requirements, performance characteristics, and maintenance and cleaning of hydraulic systems. Emphasis is placed in the fact that smooth, efficient, economical operation of any oil-hydraulic mechanism depends as much on the liquid which transmits the power as on the design, and operation of the mechanical parts.

DEPTH GAGE TABLES—For Tanks With Flat Ends. By W. M. Fogle. Also published by W. M. Fogle, 2412 North Beachwood Drive, Los Angeles. $5.

This book of tables gives volumes in U. S. gallons at various depths in inches for horizontal cylindrical tanks with flat ends, from 12 to 96 in. in diameter.

QUESTIONS on TECHNOLOGY

by W. L. Nelson

Consulting Engineer

Property Changes During Storage of Gasoline

Would you kindly direct me to a source of information where I could locate curves, etc., correlating loss of vapor pressure and Motor Method octane number with weathering of motor gasoline in tank storage?—F.B.C.

Three or four major factors are involved in the weathering of gasoline in tanks. These are:

1. Rate of loss of gasoline.
2. Change of vapor pressure.
3. Change in octane number or other properties.

In addition, the type of storage, i.e., fixed cone roof (painted or sprayed), pontoon roof, balloon or gasometer type, or pressure (spheroid or hemispheroid) tank, vitally affects the rate of loss. Presumably only the fixed cone-roof tank is involved in the question. "Filling" losses are usually equally as significant as "standing" losses but in general the effect of loss on gravity, vapor pressure, or octane number should not be much affected by the kind of loss (filling or standing).

Chenicek and Whitman in "Determination of Evaporation Losses," A.P.I. Proceedings 1930 (Chicago meeting, November 12) determine the loss as a function of vapor pressure, in fact, recommend vapor pressure as the best method of estimating losses. They find that losses are related to vapor pressure as indicated in Table 1.

The figures of Table 1 are somewhat confusing or misleading because the gasolines in each of the tanks (or tests) had different vapor pressures, and because the unprotected tanks showed a rapid loss in vapor pressure with the first loss from the tank. However, the curves of vapor pressure versus loss are almost straight lines on semilogarithmic paper (V.P. on the logarithmic scale).

TABLE 1—APPROXIMATE VAPOR PRESSURE VERSUS LOSS IN GASOLINE STORAGE

Vapor pressure		"Standing" loss		Loss per "filling"	
mm.	psi.	Protected %*	Unprotected %	Fixed roof	Floating roof
550	10.63	0	0	.....	.....
500	9.67	0.15	0	.....	.....
450	8.70	0.35	0.15	.....	.....
400	7.74	0.95	0.30	.....	0.2-0.7
350	6.87	1.70	1.15	0-0.23	0.9-1.45
300	5.80	2.75	2.20	0.2-1.3	1.95-2.5
250	4.84	4.10	3.60	1.0-2.7	3.25-3.8
200	3.87	...	...	3.0-5.0	.....

*Protected with a breather bag.

TABLE 2—STANDING EVAPORATION LOSSES—MOTOR GASOLINE

Tank capacity bbl.	Loss % of capacity	
	Per year	Per month
1,500	5.5	0.46
5,000	4.5	0.37
15,000	3.5	0.29
37,500	3.25	0.27
55,000	3.0	0.25
80,000	2.6	0.22

Substantial data are available relating loss to time. C. C. Ashley in "Evaporation Losses of Petroleum Oils from Steel Storage Tanks," The Oil and Gas Journal, November 18, 1938, page 170, shows evaporation loss (gallons per square foot oil surface per month) as a function of vapor pressure and storage temperature during standing and filling and for several types of tanks. According to his Table 3, a 9.5-lb. gasoline stored in a cone (fixed) roof tank at a temperature of 75° F. shows a loss of about 0.375 per cent per month. Wilson, Atwell, Brown and Chenicek in "Prevention of Evaporation Losses from Gasoline Storage," Refiner and Natural Gasoline Manufacturer, October 1925, page 34, show several curves of loss versus time and one of these shows 0.34 per cent per month for a fixed-roof tank. The first table by H. J. D'Aragon, "Protective Storage at Pipe Line Terminals," Petroleum Engineer, March 1944, is shown here as Table 2.

The data of Table 2 represent the behavior of motor gasoline in cone-roof, gas-tight storage tanks equipped with conventional pressure and vacuum valves.

Finally, some information on rate of loss is given by Hoppel & Heath in "A Study of Gasoline Evaporation Losses," The Oil and Gas Journal, March 23, 1943, page 160, and by McCullough, Legatski and Pixley, "Reducing Losses of Volatile Liquids in Atmospheric - Pressure Storage," National Petroleum News, February 6, 1946, page R-122.

Apparently nothing appears in the literature with respect to loss in octane number by evaporation losses. Nevertheless, loss in octane number can be computed with reasonable accuracy by noting that the material that is lost is composed of propane and butanes and has a blending octane number of about 100. Using such a figure the loss in octane number of a 70-octane - number motor gasoline is shown, along with volume loss and vapor pressure loss, in Table 3. Attempts to check the vapor-pressure loss by computations indicate that the material that is lost is half or more propane.

TABLE 3—APPROXIMATE CHANGES OF PROPERTIES AND LOSSES DURING STORAGE OF MOTOR GASOLINE IN FIXED-ROOF TANKS (NOT FILLING)

Loss, per cent	Months	Vapor pressure loss, psi.		Oc. No. loss computed
		Literature	Computed*	
0.3	1	1.65	0.83	0.11
0.6	2	2.10	1.66	0.21
0.9	3	2.50	2.49	0.32
1.2	4	2.85	2.72	0.42
1.5	5	3.15	2.95	0.52
1.8	6	3.43	3.18	0.63

*Based on half propane, half butanes.

Distribution of Sulfur In Oil

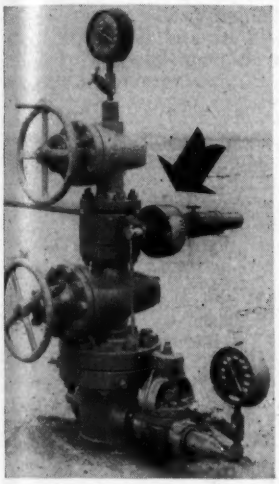
What is the sulfur content of various parts of a crude oil? Isn't the sulfur low in the gasoline?—R. A. P.

Few complete data are available but in general the sulfur content increases in nearly a linear fashion with increases in the boiling point of the fraction. Mithoff, MacPherson, and Sipos (California Crude Oils, The Oil and Gas Journal, November 6, 1941, page 81) present the most complete data. Their results indicate in general that the sulfur content of the fraction that boils halfway in the boiling range of the crude oil is about the same as the sulfur content of the crude oil. They present the sulfur content of the fractions of seven crude oils.

OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

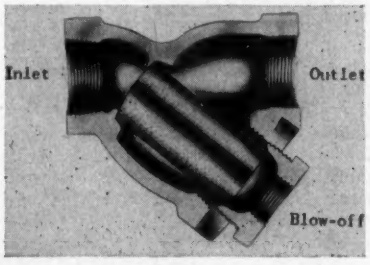
by John M. Spears



(1) DIRECT-CONNECTED FLOW BEAN simplifies flow hookup and permits quick, positive shutin. New 15,000-lb.-test adjustable flow bean connects in direct line with the flow hookup master valve. It not only permits passage of swab, testing equipment, etc., but provides six different-sized orifices which can be individually positioned in the line of flow by the fractional turn of an orifice-carrying disk. In addition, positive shutin control may be had by simply installing a blank insert in any one of the six orifice positions. *Willis Oil Tool Co.*

IT'S NEW CHECK IT

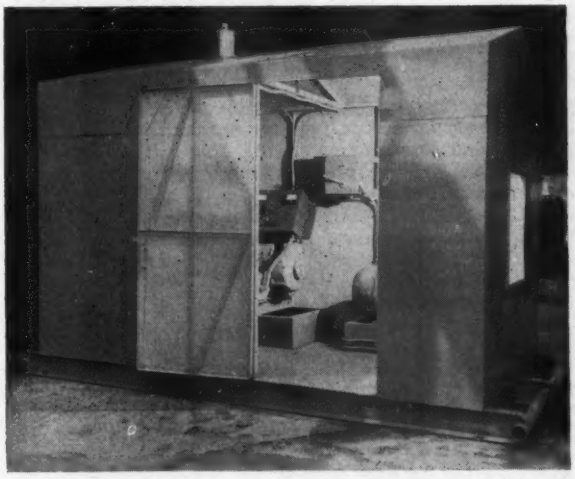
(2) STREAMLINED Y-TYPE STRAINER for steam, air, gas, oil, or water, overcomes back pressure through a new arrangement of interior surfaces, guiding liquids or gases on a course unobstructed by sharp corners or abrupt changes in path of flow. Strainers are self-cleaning by opening of blow-off cock, which flushes grit and dirt out of strainer by line pressure, without shutting off the line or removing the strainer elements. Free hole area of the screen element in the strainer body is from 2 to 4 times the area of the pipe connection, depending upon service for which strainer is used and size of strainer.



Units are suitable for working steam pressures up to 250 psi. and temperatures up to 450° F. For cold-line use pressure rating is 400 psi. *Wright-Austin Co.*

IT'S NEW CHECK IT

(3) NEW FIELD-UTILITY UNIT is a combination air compressor, lighting generator, and washdown pump for use as an auxiliary on drilling rigs. It has a 20-kw. direct-current generator set which supplies steady dependable electric current for the operation of the air compressor and washdown pump, with ample reserve for the rig lighting and other electric motor-driven



equipment. Use of the G.M. diesel engine as a prime mover assures dependable and economical performance with a minimum of weight. Entire unit is mounted on a heavy-duty oil-field-type skid base and is housed in a sheet-metal tool-house-type enclosure. Unit has a special electric control panel. *Stewart & Stevenson Services.*

IT'S NEW CHECK IT

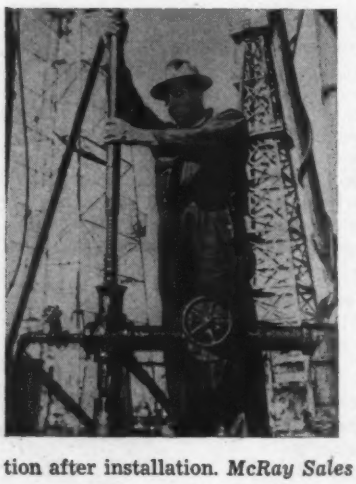
The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

OIL AND GAS EQUIPMENT Digest — IT'S NEW CHECK IT

(4) FREE HYDRAULIC PUMP eliminates pump pulling by a turn of four-way valve, installed at the well head, which controls the surfacing, seating, and shutoff and bleeding operations. To surface the free pump, power oil is directed down the production tubing and underneath the pump and up the power tubing. To seat it, pressure is directed down the power tubing. Its performance is identical to the conventional Kobe hydraulic pump, which is a fixed-type pump. Power oil directed down the power tubing actuates the double-acting reciprocating engine in the engine end of the unit which in turn actuates pump in the pump end. A packer nose assembly, equipped with cup and wafer-type rubber packers provides a lifting area to raise and lower pump in the hole hydraulically. It operates in three different systems: Parallel, consisting of a string of 2 or 2½-in. EU power tubing and 1 or 1¼-in. NU production tubing; concentric, consisting of power tubing set inside production tubing; casing type, consisting of power tubing anchored in a bottom-hole packer inside the casing. *Kobe, Inc.*

IT'S NEW CHECK IT



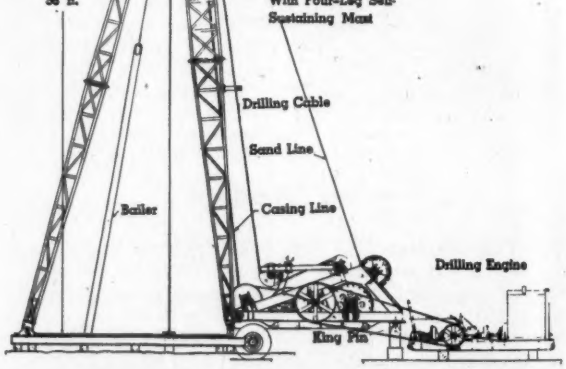
(5) ELECTROLYTIC TREATER removes scale and prevents its formation on subsurface equipment of oil wells. Run in the well on the end of the rods or in a tube on the bottom of the tubing string, treater sets up an electromotive force in the fluid, which renders the salts and minerals inert. At the same time it removes the scale, and stops corrosion and electrolysis. Requires a minimum of attention after installation. *McRay Sales Co.*

IT'S NEW CHECK IT

(6) DRESINOL, a new chemical plugging agent, substantially reduces the cost of secondary recovery of crude oil by water flooding, and at the same time increases the output of oil. Chemical is pumped down ordinary water-intake wells. It plugs the most permeable layers of sand which no longer have recoverable oil so that water, forced down the intake well, exerts pressure on more tightly packed layers of sand and forces previously untapped oil deposits to output wells. New chemical is designed to offset water forced down the intake well from seeping into loosely packed sand strata, "thief sands" which already have been drained of oil. *Hercules Powder Co.*

IT'S NEW CHECK IT

(7) LIGHT-WEIGHT SPUDDER is powered by drilling engine set out in front of machine driving to countershaft on spudder. Bullwheel shaft holds over 6,000 ft. of 1-in. drilling line. The 5-in. tubular axle and four 12 by 20 pneumatic tires on an 82-in. track give complete stability on roads, low center of gravity. Calf reel



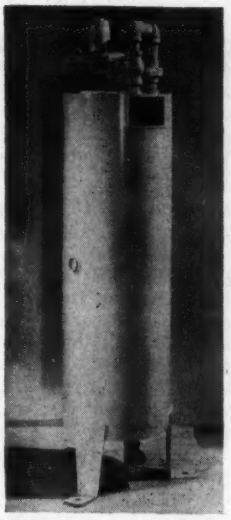
has Airflex clutch which facilitates running pipe. Friction clutches on machine are of Fawick Airflex type providing fingertip control. Two pitmans permit beam sheave to slide crosswise backwards and forwards on its shaft, spooling the cable automatically on the bullwheel shaft. Self-supporting mast. Bullwheel and sand reel have double brakes. *Young Engine Corp.*

IT'S NEW CHECK IT

(8) ACALOY GAGE CASE is made of high-compression molded-aluminum alloy. Surface of the case is treated by a patented process to prevent corrosion, and will withstand 1,500-hour salt-spray test. Over this treated surface there is a black baked-on finish. Case is weatherproof since it is provided with a synthetic-rubber sealing gasket and a stainless-steel snap ring. New case will accom-

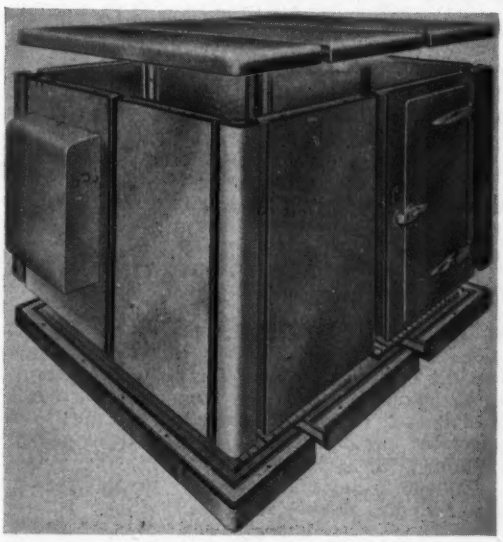
modate safety blowout disk. Faces within case are easily read. *Helicoid Gage Division, American Chain & Cable Co., Inc.*

IT'S NEW CHECK IT



(9) GAS VOLUME TANK acts not only as a reservoir for gas-distribution system and engine, but also as a settling tank or trap for foreign particles and oil. Two-compartment unit has a maximum working pressure of 50 psi. on the high-pressure compartment and 10 oz. on low-pressure compartment. High-pressure cylinder capacity is 2,644 cu. in.; low-pressure is 2,644 cu. in. Compartment heads are inset within the cylinder, reducing tension on the wells. Unit is assembled with regulator. *Continental Supply Co.*

IT'S NEW CHECK IT



(10) NEW SECTIONAL COOLERS for refinery and field use, are constructed on a hardwood framework, treated with waterproof and rotproof compounds. They are then insulated with 6 in. of Fibreglas, sealed with a vapor-proof barrier, and clad in sheet aluminum. Coolers are light in weight and a single panel can be lifted easily by two men. Temperatures are maintained from —10° F. to medium ranges. A packaged refrigeration system equipped with Recomatic, automatic defrost system, is optional with the cooler. *Refrigeration Engineering Corp.*

IT'S NEW CHECK IT

(11) DIRECT-READING pH METER can be used at a bench or table for tests of small samples. Electrode assembly is an integral part of the instrument and is mounted on the inner side of the door of a compartment in the meter's metal case, protected from accident. Line operated from any a.c. outlet meter can be left plugged in, ready for immediate operation by merely opening the door. For continuous indication directly on process operations, hooks on back of case permit suspension over a vat or tank and—with electrodes at any desired distance from meter—hanging from a rack or mounting on a wall. Accuracy is 0.10 pH; range 0 to 14 pH. Weighs only 10 lb. *Cambridge Instrument Co., Inc.*

IT'S NEW CHECK IT

(12) ONE-PIECE NEOPRENE SUIT protects against splashes and sprays of heavy acids, caustics, and oils in inspecting and repairing acid equipment, pipe lines, cleaning tanks and vats, and general emergencies. Suit consists of double-coated Neoprene material, fully vulcanized at all seams. Full-length zipper closes the opening and in addition is protected by an overlapping fly front which fastens down with snap buttons. Sleeves are fitted with gum Neoprene cuffs on the inside which fit close to wrist. *Industrial Products Co.*

IT'S NEW CHECK IT

TRADE LITERATURE

(13) PRESSURE SWIVEL JOINTS. Conservation of rotary drilling hose with swivel joints is emphasized in two-color descriptive material covering various oil-field uses of high and medium-pressure swivel joints. Also describes all-steel drilling and mud-circulating hose. *Roofe Machine Works, Inc.*

IT'S NEW CHECK IT

(14) GAS-LIFT EQUIPMENT. A 12-page, 2-color gas-lift catalog describes two types of flow valves and the two types of controllers of manufacturer. A section de-

scribing company service includes a series of eight schematic illustrations showing various types of installations to solve difficult lifting problems. *Camco, Inc.*

IT'S NEW ✓ CHECK IT

(15) PLASTIC FIRE BRICK. New 40-page, 2-color brochure covers plastic fire brick, anchors, specifications, installations, applications, specialties, engineering data, and stocks. Photographs of actual installations and line drawings of units included. *Laclede Christy.*

IT'S NEW ✓ CHECK IT

(16) MASS SPECTROMETER. A 20-page profusely illustrated folder describes manufacturer's mass spectrometer. Description emphasizes rapid and accurate analyses of complex mixtures including exhaustive breakdown of hydrocarbon stream samples. *Consolidated Engineering Corp.*

IT'S NEW ✓ CHECK IT

(17) PORTABLE DRINKING FOUNTAIN. New two-color folder describes and illustrates drinking fountain for oil-field workers, pipe-line crews, etc. Push-buttom control provides sanitary water at all times. Construction features and specifications included. *Dobbins Manufacturing Co.*

IT'S NEW ✓ CHECK IT

(18) IDEAL TUBE EXPANDER. New bulletin describes and gives a complete list of sizes of an improved tube expander, designed with a new short frame especially adaptable for use in small headers or other close quarters where tube holes are not in direct line with the hand tools. *Gustav Wiedeke Co.*

IT'S NEW ✓ CHECK IT

(19) LUBRICATED PLUG VALVES. Complete and up-to-date information on manufacturer's lubricated plug valves is contained in new 87-page plastic-bound catalog. Sectional views of various types of plug valves, identifying different parts of the valves, are shown. Also includes working-pressure ratings for all classes and series. *Walworth Co.*

IT'S NEW ✓ CHECK IT

(20) MAGNETIC LEAKPROOF GAGES. New two-color folder describes and illustrates liquid-level gages used with liquefied petroleum gases under pressure. Features safety with magnet mounting. *Rochester Manufacturing Co., Inc.*

IT'S NEW ✓ CHECK IT

(21) V-BELTS Catalog describes features of adjustable V-belt, construction details. Illustrates how to couple and uncouple, measure, and install. Also includes engineering data and 13 pages of application photos showing installations. *Manheim Manufacturing & Belting Co.*

IT'S NEW ✓ CHECK IT

(22) HOISTING EQUIPMENT. A four-page pictorial bulletin describes cranes, winches, and capstans for loading, unloading, and transporting pipe, machinery, and other heavy or bulky items in oil fields and refineries. Emphasizes speeding up materials handling, maintenance, and repair. *Silent Hoist & Crane Co.*

IT'S NEW ✓ CHECK IT

(23) REGULATOR INTERCHANGEABILITY. New four-page bulletin in color discusses four important phases of interchangeability as applied to a well-integrated line of regulators. Booklet lists, in table form, key internal working parts of regulators which are renewable and interchangeable in various sizes of manufacture's regulators serving different functions. *Leslie Co.*

IT'S NEW ✓ CHECK IT

(24) STAINLESS STEEL VALVES aid fittings, for use in refinery and natural-gasoline plants where corrosion is a vital factor in plant operation and maintenance, are described and illustrated in 55-page plastic-bound catalog. Cutaway drawings and dimension tables are included for every type valve. Field photographs show application. *Alloy Steel Products Co., Inc.*

IT'S NEW ✓ CHECK IT

(25) ANNUAL REVIEW. New 32-page brochure reviews latest equipment of manufacturer now in use in petroleum, chemical, construction, and other industries. Illustrations include photographs, flow diagrams, and cross-section drawings. *Allis-Chalmers Mfg. Co.*

IT'S NEW ✓ CHECK IT

(26) OIL-INDUSTRY FORMS cover every phase of reporting and accounting in all divisions of the industry. Forms are specially designed for petroleum accounting; general administration needs; material purchase and control; billing; land and geological; drilling; trucking; employment, personnel, and timekeeping, etc. All forms are designed for easy reference and ready entries. They are available in any quantity and adaptable for various types of binding. *Ross-Martin Co.*

IT'S NEW ✓ CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Suction Lift of Pumps

STATEMENTS of the average suction lift of pumps as stated in Table 1 for water, are somewhat misleading because the lift (or head required) is greatly affected by the design of the pump, the vapor pressure (or temperature) of the material being handled, and the capacity at which the pump is operating.

Suction fails directly as a result of vaporization at the inlet or moving part of the pump. Thus, in pumping a material which exerts no vapor-pressure, the pump shoul should theoretically be able to suck or lift a liquid column equal in weight to the atmospheric pressure (34 ft. of water). In actuality, the effect of (1) barometric (or tank) pressure, (2) friction loss in suction line, (3) head required to start motion in the fluid, (4) vapor pressure of liquid, and (5) entry or pickup losses into the pump, must be subtracted from the theoretical head (or standard barometric pressure). If the sum of subtracted items is larger than standard atmospheric pressure, it means that a positive head is required on the suction of the pump. The first three items are small or may ordinarily be neglected; barometric pressure is mainly important at high altitudes, friction losses in the suction line are not large unless a foot-valve is employed or if the line becomes accidentally plugged, and the head required to impart motion to the liquid seldom exceeds 0.1 ft. of fluid.

If a pressure or vacuum is maintained on the liquid supply, the situation is not altered from the discussion given above except that the tank pressure (expressed as feet of fluid) is substituted for the standard barometric pressure.

Vapor-Pressure Correction

Reid vapor pressure, as used so extensively by petroleum refiners, is considerably in error particularly for aerated liquids or "gassy" materials such as crude oil. The true vapor pressure of natural gasolines is usually 5 to 9 per cent larger than the Reid vapor pressure (Petroleum Refinery Engineering, second edition, p. 553, McGraw-Hill Book Co., Inc., N. Y. 1941) but abnormal materials sometimes exhibited true vapor pressures that are as much as 60 per cent larger than the Reid vapor pressure (see "Relation of Reid to True Vapor Pressures," The Oil and Gas Journal, May 10, 1947, p. 84). Bower and Brown (Petroleum Engineer Reference Annual 1943, p. 239) report an aviation gasoline that had a true vapor pressure (bubble point) about 87 per cent higher than its Reid vapor pressure. Only 8 per cent by volume of air dissolved in lubricating oil increases its vapor pressure to about 10.8 psi. (or a head of 25 ft. of water). All of this indicates that experimental measurements of vapor pressure by means of bubble-point determinations must be made if the effect of vapor pressure on suction lift is to be accurately known.

TABLE 1—APPROXIMATE SUCTION LIFTS OR HEADS (IN FEET) FOR PUMPS WHEN HANDLING WATER
(Parenthesis indicates that a positive head is required at the suction).

Temp. °F.	Theoretical (not attainable)	Self-priming pumps	Rotary and reciprocating	Centrifugal
200	8	(3)	(9)	(9)
180	16	6	(4)	(5)
160	23	15	2	0
140	27	21	6	5
120	30	24	11	9
100	32	26	16	12
80	33	27	20	14
60	34	28	22	15

Entry Losses

At extremely low capacities these are negligible but at normal capacities they may amount to the average figures given here:

Average self-priming pumps	1.7-3.7 psi.
Average rotary and reciprocating pumps	3.7-4.3 psi.
Average centrifugal pumps	3.7-7.4 psi.

The effect of speed on the cavitation of centrifugal pumps can be judged by the Thoma cavitation parameter (D. Thoma, Experimental Research in the Field of Water Power, First World Power Conference, London, June 30-July 12, 1924). The somewhat high entrance or pickup losses of centrifugal pumps can be greatly improved by so-called pickup blades which guide or direct the liquid into the main impeller.

Example.—A rotary pump is handling a 0.80 specific gravity liquid which has a bubble-point pressure of 9.3 psia. at the pumping temperatures. The lift that might be expected when taking suction from a tank at atmospheric pressure would be:

$$14.7 - 9.3 - 4.0 = 1.4 \text{ psia.}$$

This corresponds to a lift in feet of:

$$\frac{1.4}{14.7} \times \frac{3.4}{0.8} = 4.05 \text{ ft.}$$

If the liquid were heated to 166° F. whereat it exerts a vapor pressure of 30 psia., has a specific gravity of 0.62, and is held in a vessel at 30 psia. so that it is boiling, a positive head would be required, as:

$$30 - 30 - 4.0 = -4.0 \text{ psia.}$$

This corresponds to a head of:

$$\frac{4.0}{14.7} \times \frac{34}{0.62} = 14.9 \text{ ft.}$$

The same situation arises for any boiling liquid, i.e. the positive head required is equal only to the entrance losses and the suction-line friction loss (if any).

No. 155 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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MODERN Rotary DRILLING

Miscellaneous Hoisting Equipment

NUMEROUS changes of design have been made to adapt the crown and traveling blocks to the requirements of present-day drilling. All these changes had to be made within the limitations imposed by the dimensions and the design of the derrick.

Bearings.—Factors affecting the design of bearings for the crown and traveling blocks include: increased loads, necessity of overcoming the increased force tending to overturn the traveling block, and the need for narrower blocks.

As far as capacity is concerned, consideration has to be given to the factors of speed, increased loads, and longer periods of operation. Present high speeds of rotary rigs, even if considered alone, require substantial increase in capacity of the block bearings. In the formula for radial bearing rating, the speed factor, by which the rating is to be multiplied, changes from 1.000 for speeds of 100 r.p.m. to 0.653 for speeds of 360 r.p.m.* Fast-sheave speeds of this magnitude occur quite frequently with line speeds and sheave diameters now used. Increased loads of long pipe strings and longer roundtrips, during which the blocks are in continuous operation, put additional demands on the blocks' bearings.

The overturning force, particularly apparent when the traveling block is operating at high speeds with light loads, tends to tilt the block toward the side of the slower sheaves. This overturning effect is increased by high speeds and by the increased arm of leverage, created by large-diameter sheaves now used. This force puts special loads on the bearings.

With a large amount of pipe to be stacked in the derrick, the width of the traveling block has to be kept to a minimum. This precludes use of wide bearings, one of the possible means of increasing the stability of the block.

All these different problems have been met in a number of ways. Roller bearings are now used throughout. They are sometimes of large diameter to place the support as close to the sheave groove as possible, thus increasing the block's stability. Tapered roller bearings, when used, take all the side thrust, eliminating the need for use of spacers between the sheaves. This reduces radically the width of the blocks. Also, the reduced length of the center pin results in higher capacity in relation to weight. Positive lubrication is provided.

Sheaves. — Heat treatment and use of special alloys increases the life of both the sheaves and wire rope. Important, from the point of view of inventory needs, is the arrangement permitting interchangeability of the crown and traveling-block sheaves and of sheaves within each of the two blocks. This feature makes possible also the now quite generally accepted practice of periodically interchanging the fast and the slow sheaves of the traveling block, which results in better distribution of wear.

Other details. — Increased loads require special rigidity of the frame of the crown block. In certain types special truss construction is used which distributes the load to all the four beams of the frame. As far as the traveling block is concerned special attention is given to the design of guards, to speed up and facilitate the reeving. The lower clevis is usually so constructed that it may be used as a support to stand the block upright on the derrick floor. Designs resulting in a low center of gravity are used to further increase the stability of the block while running with light loads at high speeds. The traveling blocks are streamlined as a safety measure, precluding the possibility of protruding parts catching on clothing or equipment during high-speed operations.

Design of modern traveling blocks suggests the advisability of using matched sets of companion equipment as far as crown and traveling blocks are concerned. Use of a modern, narrow traveling block with a wide crown block would result in an excessive fleet angle of the wire rope at the time the traveling block is approaching its highest position in the derrick. This would bring about excessive wear of line and sheave flanges.

Power Slips

Present-day drilling imposes two important requirements on rotary slips. First, support must be given to extremely long strings of pipe without damaging the pipe. Second, the necessary increase in size and weight of slips cannot go beyond the point where ease and speed of handling is impaired.

These problems have been solved by special tooth designs, by arrangements distributing the load evenly among the slip segments, by increasing the gripping area, and by body construction eliminating all excess metal. Newest approach to the problem is power-operated slips. Around 100 power slips have been put into operation, since their introduction 2 years ago.

While the primary purpose of the power slips is to reduce the fatigue of the crew in handling of heavy slips during the long roundtrips, there are some additional advantages. One is the increased safety, since the floor men do not handle the slips, while the pipe is run into the hole; the other is speeding up of the trips. Records indicate that the per-trip saving of time is relatively small. With a large number of trips, however, the per-well savings are worth while.

The slip-mechanism portion of the assembly is formed by a slip ring which, in operating position, is positioned above the rotary table and is concentric with the master bushing opening. Three insert-type slips hang from the slip ring. The connection of the slips to the ring is by links, permitting flexibility. When the ring is in its top position, the slips are elevated sufficiently out of the bushing to permit running of pipe into the hole. The slips are set by lowering the ring. A special hinged plate, placed on the bushing, guides the slips on the down stroke and retains them in proper position at top of stroke.

The raising mechanism consists of an arm, two operating cylinders, and necessary controls and safety devices. One end of the horizontal arm, extending over the table, forms the circular "arm gate" within which the slip ring is fastened. The other end is attached through a hinge bolt and swivel to a heavy plate topping the two vertical operating cylinders.

*C. R. Athy: "Load Ratings for Roller Bearings"—A.P.I. Drilling and Production Practice—1939, p. 600.

No. 31 in a series by Joseph Zaba, petroleum engineer, Houston

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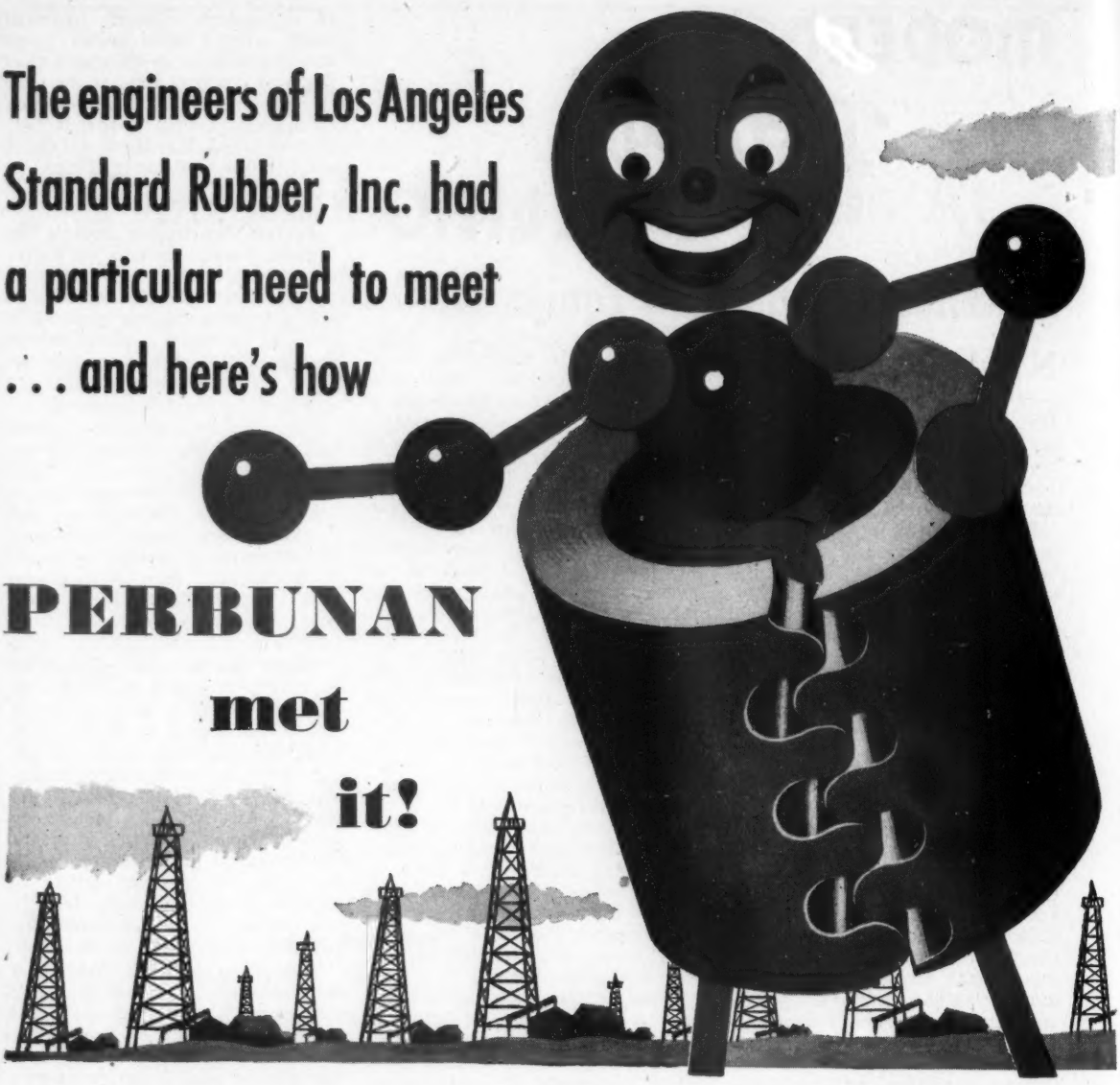

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ENGINEERING *fundamentals*

Several Tests Are Available For Testing Hardness of Metals

HARDNESS in metals usually is defined as resistance to permanent deformation, and is measured by any of a number of arbitrary standards on machines built to measure the indentation caused by a given load applied through a tool of a given size, shape, and material. Resistance to abrasive or cutting action is also an indication of hardness.

Since hardness is the ability to resist permanent deformation, and since the elastic limit is the load above which permanent deformation occurs, there is, for most metals, a fairly close correlation of values for hardness, elastic limit, and ultimate strength. Hardness as expressed by one test may be converted to values for other hardness tests with fairly accurate results within certain limits. Hardness tests are easier to make than most of the other physical tests, and possess the additional advantage of being nondestructive.

Although, in general, hardness is indicative of tensile strength, it is not safe to assume that just because a material is very hard it is also proportionally strong. Many steel parts, slush pump rods, for example, have their wearing surfaces hardened to values much higher than those for the interior of the piece, which is left softer to improve the impact and fatigue properties of the part. Obviously, tests on the hard outer case would not be criteria for estimating the tensile strength of the piece.

A few of the common hardness tests are:

Brinell.—Dr. J. A. Brinell, a Swedish engineer, invented this method of hardness testing about 1900, and it has been very popular ever since. Essentially, the method consists of measuring the indentation made in the test material by a hardened steel ball of 10 mm. diameter, under a load of 500 kg. (1,100 lb.) for soft material or 3,000 kg. (6,600 lb.) for hard material. There are a number of accepted variations of this test, and in order to prevent confusion, the ball diameter and the weight of the load should always be reported as part of the test.

Rockwell.—When the Rockwell hardness tester was first introduced, it had only two scales, the B and C, and these are still the most common scales. However, there are 13 other Rockwell scales, each designated by a letter of the alphabet, and the Rockwell hardness number always should have a prefix of the appropriate letter. The Rockwell machine measures depth of penetration into the test material of, for the B scale, a 1/16-in. ball under 100-kg. load or, for the C scale, a rounded diamond cone under 150-kg. load. The machine registers the hardness number on a direct-reading dial, which is advantageous in that no measurements or calculations are required.

Vickers.—This is an English method that has attained considerable favor in this country. It is somewhat similar to the Rockwell, in that a diamond cone is used as the penetrator. The Vickers hardness number is expressed in kilograms per square millimeter, and, to the value of 250, the Brinell and Vickers are identical.

Firth.—This is also an English system, very similar to the Vickers. The Vickers and Firth values are interchangeable.

Shore scleroscope.—This test, which is very popular, measures the rebound of a small, standard, diamond-tipped hammer after a drop from a height of 10 in. The scale is arbitrary. A certain hardened tool steel causes a rebound of about 6.5 in., and this steel was given the number 100. Other values are based upon this standard.

Test files.—A rapid and convenient method of ascertaining approximate hardness is to stroke the test piece with a test file of known hardness. The advantages of this simple test are obvious, and by using several different files, results of sufficient accuracy for most practical purposes can be obtained.

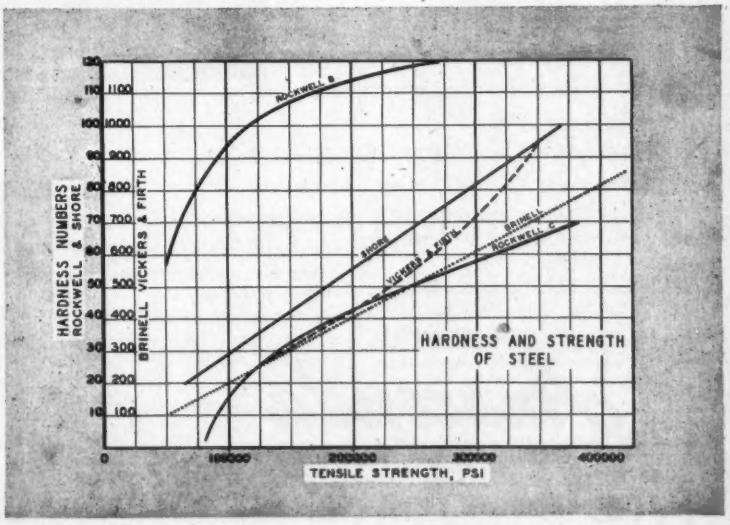

Fig. 3—Appropriate relation of strength to various hardness scales

Series reported by H. M. Lyle, district engineer, Corpus Christi, Seaboard Oil Co. of Delaware

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REFINING

Centrifugal Compressor For Propane Tested

A SUCCESSFUL run-in test of a centrifugal compressor for handling propane and similar gases was completed in mid-July by the Carrier Corp., preparatory to installing the compressor in the dewaxing plant of Atlantic Refining Co. at Point Breeze, Pa. E. B. Badger & Sons Co. are installing the new design for use in refrigerating lubricating oils in the dewaxing process.

The entire unit occupies a floor space of only 5 by 15 ft. The saving in floor space is 66 per cent; savings in first cost alone is about 50 per cent, H. H. Robie, of Badger, said.

This Atlantic unit is Model 18T300, has five stages, and handles 2,000 cu. ft. per minute at 21 psia. inlet pressure and —22° F., discharging into a compressor at 195 psia. It absorbs 975 hp. to operate and runs at 9,400 r.p.m., driven by a 1,085-hp. steam turbine which will use 600 psig., 700° F. steam.

The compressor models include three to five stages, to handle 1,000 to 30,000 cu. ft. per minute of gases, and will require up to 8,500 hp. each. These units can be operated at pressure (inlet) up to 200 psig., at temperatures ranging from 150° F. to 150° F., it is stated.

Dr. L. M. Goldsmith, chief engineer of Atlantic, believes that this is only one of several applications of the centrifugal to refining operations. The compressors are applicable to handling air, gas, etc, in catalytic cracking, alkylation, dewaxing, light ends recovery, and for handling all plant air compression, etc. engineers point out, in refining, cycling, and gasoline plant operations.

Shell Refineries Set Production Records

The Wood River, Ill., refinery of Shell Oil Co., Inc., produced 127,260,000 gal. of petroleum products in June, 10,080,000 gal. more than during the same period a year ago.

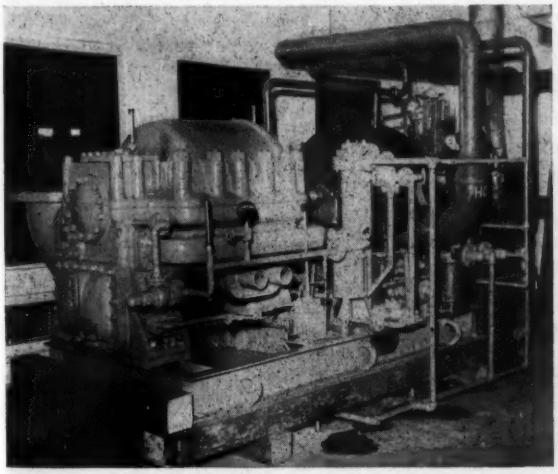
Pointing out that the Wood River record was made in a region where oil supplies are tightest, H. S. M. Burns, Shell president, said that it was made possible only "by moving a record volume of crude oil into the refinery," by pipe lines, Mississippi River barges, and tank cars.

C. E. Davis, Shell vice president in charge of manufacturing, said all Shell refineries now are processing crude oil at a rate well above their rated capacities and said total production for June was 12 per cent higher than it was a year ago and well above the wartime peak.

Another production record was set by Shell's Houston plant, where the June total output was 117,180,000 gal., against 100,800,000 gal. for the same

Canadian Polymer Corp. Expands Ethylene Capacity

SARNIA, Ont.—The Polymer Corp., which produces synthetic rubber and products, is quadrupling its capacity for the production of ethylene as an



The first centrifugal compressor ever to use propane in a refrigeration cycle is shown above during a successful run-in test in the plant of Carrier Corp., Syracuse, N. Y. Unit includes compressor, turbine, auxiliary oil pumps, and oil coolers, it requires a floor area only 5 ft. wide by 15 ft. long. It will be used by Atlantic Refining Co. in its dewaxing process.

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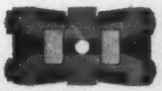

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—for use in atmospheres containing Methane or natural gas, gasoline or petroleum vapors. This double-safety lantern has a tamper-proof reflector and cover with locking device and seals. Throws 1500 ft. beam. Instantly ejects broken bulbs from battery circuit. Large handle—360° pivoting feature gives direct illumination where needed and leaves both hands free for work.

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"CLEARSITE"
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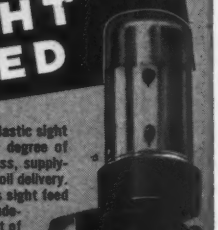
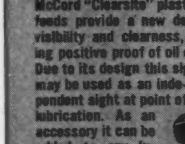


McCord "Clearsite" plastic sight feeds provide a new degree of visibility and clearness, supplying positive proof of oil delivery. Due to its design this sight feed may be used as an independent sight at point of lubrication. As an accessory it can be added to any lubrication system. Specify "Clearsite."

McCORD "SF" LIQUID SIGHT FEED LUBRICATORS



A highly developed lubricator, particularly adapted to cylinder and bearing lubrication. Features: Precision built, most flexible and positive oil delivery system known. Supplied in 1 to 24 feeds. Specify McCord "SF" Lubricator.

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intermediate for the manufacture of plastics, resins, and other synthetic chemicals, it has been announced.

M. W. Kellogg Co. is carrying out the work which started in March. When completed the expanded plant will be capable of producing 120,000 lb. per day of ethylene of 95 per cent or higher purity. Refrigeration will be increased from —30° F., employed up to the present, by using ammonia units, to —120° F., by adding to the system a special propane-ethylene refrigerating unit. The system will process light gases from the nearby Imperial Oil, Ltd., refinery waste gases.

Features of the plant include the use of 3½ per cent nickel steel alloys in tubes and shells of low-temperature heat exchangers; extra drying equipment to eliminate water from the exchangers at the low temperatures employed, and a specially-designed 50-plate fractionator which will improve the purity of the final product. This capacity for ethylene will supply all of this intermediate that is required by Canadian chemical industry processes, it is said.

Inert Gases Eliminate Air-Isobutane Hazards

Explosion hazards of mixtures of air and isobutane have been successfully eliminated through introduction of certain inert gases, according to a Bureau of Mines report describing the results of a study at the Central Experiment Station, Pittsburgh.

Citing a practical application of the tests, either nitrogen or carbon dioxide may be used to render the atmosphere inside an isobutane storage tank free of explosion dangers when making repairs involving welding, the report says. Bureau tests to determine ignition and explosion hazards of isobutane proved that when 39.9 per cent of nitrogen or 26 per cent of carbon dioxide was added to an isobutane-air mixture, the mixture became noninflammable. A table showing the amount of inert gas needed to render other combustible-air mixtures noninflammable also is included in the publication.

Government Refinery in Texas City Up for Sale

A surplus aviation-gasoline refinery near Texas City, Tex., is being offered for sale or lease by War Assets Administration. The refinery, formerly operated by Southport Petroleum Co. of Delaware, was built by the Government in 1942 at a reported cost of $11,498,103. It is capable of independent operation for the production of automotive fuel and petroleum products, WAA said.

Bids to buy or lease must be received by the WAA regional office, Houston, not later than 10 a.m., August 4. The refinery occupies a 35-acre site 1 mile from Texas City and 35 miles from Houston. Major production units include Houdry catalytic cracking and gas concentration units having a daily stream capacity of 13,000 bbl. of virgin gas oil; and a Universal Oil Products HF alkylation unit with a daily rated capacity of 1,600 bbl. of aviation grade alkylate.

$100,000 Chimney Project Under Way at Port Arthur

First of six radial brick chimneys designed to handle oil still gases up to 1,200° F. is being built by Rust Engineering Co., Pittsburgh, for Gulf Oil Corp. at its refinery in West Port Arthur, Tex.

Four of the chimneys, including the one now under construction, will be 150 ft. high with an inside diameter of 7 ft. and two will be 125 ft. high with an interior diameter of 8 ft. All will have full-height fire-brick lining.

Construction of this $100,000 chimney project is scheduled to continue until all six are completed, it was announced.

Bureau Resumes Conversion Work at Louisiana, Mo.

Conversion of the Missouri Ordnance Works near Louisiana, Mo., from synthetic ammonia to synthetic liquid-fuels production, started late in 1945 by the Bureau of Mines, again is under way following an extended delay caused when the plant was taken back by the War Department for emergency production of ammonia for fertilizers.

The bureau recently took over the $17,500,000 plant and completed the return transfer of 79 engineering and administrative personnel from Torrance, Calif., to Missouri July 20, approximately a year after the property was returned to the War Department at direction of the Office of War Mobilization and Reconversion.

Design work continued during the year at Torrance, which is the headquarters for Bechtel Corp., which holds a $6,780,000 contract for engineering, design, and construction necessary under the conversion program. The construction schedule calls for the Missouri plant to be producing gasoline and oil from coal and lignite by June 30, 1948. The new synthetic-fuels demonstration plant will test fuels from several coal fields to determine their suitability for making synthetic oil and gasoline and will be operated in conjunction with a research and development laboratory at Bruceton, Pa.

NATURAL GAS

Agreements Extend U. S. Helium Control

HELIUM-BEARING natural gas in the 7,800-acre Rattlesnake field, San Juan County, New Mexico, has been placed in the status of a government reserve with presidential approval of a bill ratifying agreements with the Navajo Indian Tribe and two oil companies.

Acquiring rights to the field, the Department of Interior will pay the Navajo Tribe $147,799 advance royalty and 25-year rental and $166,594 to Continental Oil Co. and Santa Fe Corp. for value of rights conveyed to the department from their prior leasehold interests in the area.

J. A. Krug, secretary of the interior, in a department announcement, said approval of the agreement strengthens the United States' position for world control of the lightweight noninflammable gas. Rattlesnake field produces gas with 7.63 per cent helium and considerable inert constituents such as carbon dioxide and nitrogen.

Two wells drilled on the acreage have shown the high helium content of the gas. The first, drilled by Continental in 1942, found the gas at about 7,000 ft. The Interior Department recalled that construction of a helium plant to process the gas was started by the Bureau of Mines in April 1943 near Shiprock, N. M., but was placed in standby after a trial run following its completion since the demand for helium had dropped by that time.

The payments to the Navajo Tribe by the Government represent the present worth of 12½ per cent royalty on an estimated volume of helium-bearing gas in the field and rental at 25 cents an acre for 25 years. Royalties on production other than helium-bearing gas, on gas in excess of the estimated volume, and rentals beyond 25 years, will be paid as they accrue.

New T. G. & T. Rate Schedule Accepted

WASHINGTON.— — The Federal Power Commission has accepted new rate schedules filed by Tennessee Gas & Transmission Co. as a result of agreement between the company and FPC representatives who began an investigation of T.G.& T.'s rate structure in 1944.

The new rates, according to an FPC announcement, will bring an annual reduction of about $856,000 to the company's gas-distribution customers. Included are reductions of $254,207 to Hope Natural Gas Co.; $407,529 to United Fuel Gas Co.; and $150,265 to Louisville Gas & Electric Co.

The new schedule effective April 1 divides the T.G.& T. system into three zones with the monthly demand charge ranging from $2 to $1.85 per M.c.f., and the commodity charge from 12.2 cents to 9.2 cents per M.c.f. In terminating the procedings involving the company's rates, the commission said: "The agreement . . . will result in substantial savings of time and money to both the commission and Tennessee which might otherwise have been expended incident to extended formal hearings."

Panhandle Authorized to Cut Ohio Fuel Deliveries

WASHINGTON. — Panhandle Eastern Pipe Line Co. has been permitted by the Federal Power Commission to place in effect a plan providing variable decreases in the volume of natural gas which the company is obligated to deliver to Ohio Fuel Gas Co. on a firm basis.

The action was taken in a FPC order and opinion which said, "there is a pressing emergency supply situation on Panhandle's system which requires an immediate determination of the natural-gas requirements of its customers. . . . During the past year, Panhandle, due to its inability to increase its system capacity, has found it necessary to curtail firm and interruptible gas deliveries to its customers."

The variable decreases in firm deliveries to Ohio Fuel were set out in a supplement to Panhandle Eastern's rate schedule. Under a rate schedule effective since February 1945, Panhandle has been obligated to deliver 50,000,000 cu. ft. of gas daily on a firm basis to Ohio Fuel. Half of this was contracted for a period of 20 years from the effective date of the rate schedule. The second 25,000,000 cu. ft. was delivered under a war-emergency provision limited to 5 years. The supplement is directed at the provisions for delivery of the second 25,000,000 cu. ft. and leaves to the sole discretion of Panhandle the determination of the volumes to be delivered above the first 25,000,000 cu. ft.

Storage of Gas in Liquid Form Object of Research

Research on storing natural gas in liquid form to reduce storage space by 99.8 per cent is being performed by L. F. Stutzman, assistant professor of chemical engineering, and George H. Brown, instructor, at Northwestern University's Technological Institute. Under the method 800 cu. ft. of natural gas may be contained in 1 cu. ft. of storage space.

The development possibly could have effects on the conservation of gas from oil fields, and might help as an auxiliary or floating supply during periods when drain on regular service facilities is great.

The Northwestern University scientists reduced the temperature of natural gas to —260° F. by bringing it into contact with liquid nitrogen at a temperature of —320°, during a 7-month study of the research project.

Through the use of refrigeration equipment and insulated tanks Stutzman and Brown were able to show that large storage tanks can be eliminated or used for additional storage. The liquid gas may be returned to its gaseous state by reducing refrigeration and piping the gas off a storage tank and into gas mains.

Five 20-Year Franchises Given Cities Service Gas

Cities Service Gas Co. has been granted 20-year franchises by five cities in its gas-service territory, two in Kansas and three in Missouri.

The three Missouri franchises were voted in elections on the question in Warrensburg, Higginsville, and Concordia. The combined vote in the three elections was 776 for the franchises and 6 against. Kansas franchises were granted by city commissions in Hutchinson and Girard.

Gas Line From Alberta To Coast Under Study

CALGARY, Alta.—At the instance of Northwest Natural Gas Co., A. Faison Dixon, of Brokaw, Dixon & McKee, New York, is here to investigate the feasibility of a project for piping Alberta gas to communities on the British Columbia Coast, or south of the International Boundary.

The investigation follows the development in the past year of extensive new natural-gas reserves which are at present shut in.

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No. 1 No. 2 No. 3

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The O. D. WINDMASTER was designed and tested by an experienced pipe line construction man. It is new and efficient and meets a great need of the pipe line constructin industry.

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Weight: (Approx. lbs.)	4	5	6	7	7	8	8	9	10	11	12	14	18

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PIPE LINES

Colorado Interstate Line Nears Completion

At the beginning of this week, less than 15 miles of pipe remained to be laid for Colorado Interstate Gas Co.'s 250-mile 20-in. line from Hugoton to Denver.

One of the spreads of J. R. Horrigan Construction Co. has completed 120 miles. The other spread has laid more than 105 miles. It appears that pipe-laying operations for this project will be completed within 2 weeks.

Cities Service Hugoton Outlet Delayed

Because of the difficulty of obtaining pipe in sufficient quantities, the Hugoton-Kansas City project of Cities Service Gas Co. involving 404 miles of 26-in. will not be started until next spring according to present indications.

It is unlikely that there would be enough pipe on hand at the end of this year to justify starting the work. By April 1, 1948, probably 40 to 50 miles of pipe will have been delivered to the job. It is predicted that specifications will be issued, and bids invited sometime in February or March of 1948.

According to present arrangements, only 198 miles of 26-in. will be available for the 1948 construction program for this project. This will extend the line only as far as Hutchinson, Kans. Therefore, it is likely that the contracts to be let for this section will call for putting two spreads in the field. Plate for the 198-mile section is to come from the Sheffield Steel Co., Houston. This pipe will be fabricated by A. O. Smith Corp., Milwaukee.

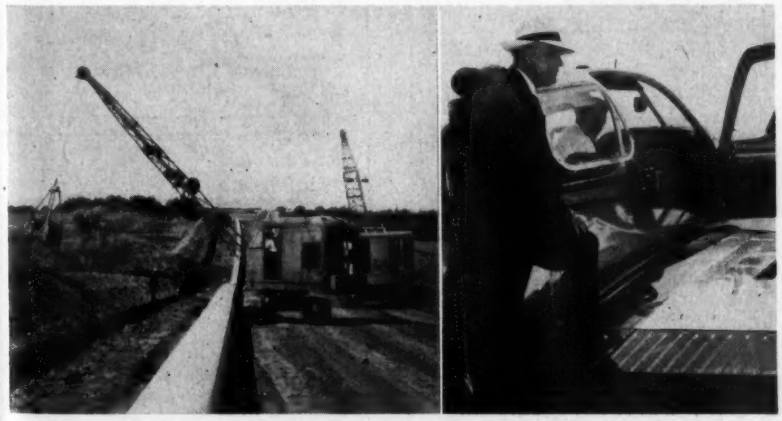
Compressor for Propane Tanker Shipments

In the transportation of propane by tank ship being pioneered this year, Warren Petroleum Corp. is installing a centrifugal compressor and auxiliaries made by Carrier Corp. These function in the operation of unloading propane from the ship. Gas remaining in the tanks of the ship after the liquid propane has been unloaded is delivered by means of the centrifugal compressor into a condenser where it is liquefied and transferred to the shore storage depot.

This centrifugal compressor equipment is installed on the ship Natalie Warren which has been prepared for the service of delivering 1,300,000 gal. of liquid propane per trip between Houston and the New York area.

Cities Service Hearing Scheduled August 6

WASHINGTON.—The Federal Power Commission has set August 6 for opening of a hearing in Washington on an application filed by Cities



Left: Two drag-lines excavating ditch in the operations contracted by J. R. Horrigan Construction Co., Oscar E. Dempsey, and Joe Dempsey, for Natural Gas Pipeline Co. of America in the laying of a 70-mile 26-in. loop in southeastern Nebraska. Right: O. E. Dempsey entering Beechcraft Bonanza flown in Rent-A-Plane Co.'s service which takes him from Tulsa to Nebraska operations every week to 10 days

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Service Gas Co. for authority to construct additional natural-gas transmission facilities and to abandon certain existing gas pipe lines in Oklahoma.

The company has requested authority to construct about 48 miles of 12-in. from a point near Guthrie to the Drumright compressor station; approximately 10½ miles of 16-in. from a point in Grady County to a connection with Consolidated Gas Utilities Corp.'s system; and approximately 15.6 miles of 16-in. extending from a point east of the Tallant compressor station to an intersection of an existing line in Washington County. The company was granted temporary authority to begin construction of the latter two lines on July 18.

United Natural To Lay 72 Miles

United Natural Gas Co. has let contract to Williams Brothers Corp. for laying 72 miles of 20-in. in Pennsylvania. The contractor's work is to be done under the supervision of G. A. Manuel who is preparing to move equipment to the project.

Phillips Shamrock Line Now Half Completed

For building the Phillips Shamrock 170-mile 6-in. section of products line from Borger, Tex., to La Junta, Colo., more than half of the pipe had been laid early this week. The contractor is Harry Liles. This undertaking of Phillips Petroleum Co. and Shamrock Oil & Gas Co. is the first step in constructing a 365-mile products line from Borger to Denver.

The remaining La Junta-Denver section must be delayed until pipe is available. It appears that construction of this second section will not get under way this year.

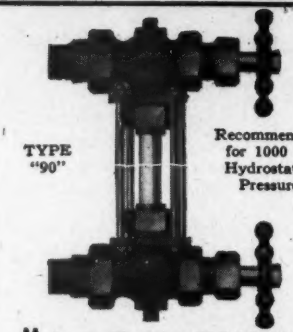
Phillips Petroleum Co. will complete within 2 weeks the laying of 15 miles of 8-in. looping the Borger-St. Louis trunk products line near Attica and Cheney, Kans., which has been contracted by W. Martin.

Seamless Pipe Used in Gas-Storage Installation

A PILOT installation using pressure vessels fabricated from lengths of seamless steel pipe for storing 1,250,000 cu. ft. of natural gas at 2,240 psi. has recently been placed in service by the Public Service Co. of Illinois near Kankakee, Ill., according to United States Steel Corp.

It is intended to supplement low-pressure distribution in the Kankakee area and provide an emergency supply for high-pressure customers in

PENBERTHY
DROP FORGED STEEL
LIQUID LEVEL GAGES



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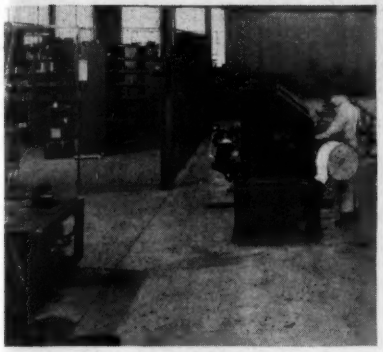

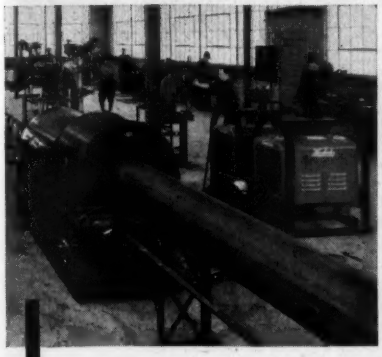

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the area normally supplied from the high-pressure distribution feeder main from Mattison, Ill. Another unit capable of storing 40,000,000 cu. ft. is now in process of construction at Evanston, Ill.

The basic design was developed by the Public Service Co. of Illinois, Stone & Webster, and National Tube Co., who produce the seamless pipe in the same mill at Lorain, Ohio, in which the pipe for the Big Inch pipe line was rolled. This pipe, of alloy steel, having a yield point in excess of 80,000 psi., is furnished by the mill in 40-ft. lengths, 24-in. o.d. and 0.512-in. wall thickness.

Each end is hot swedged to contour in five stages at National Tube Co.'s Christy Park works near McKeesport, Pa., using a 2,000-lb. steam hammer. One end is then cut to length and rough bored, after which the cylinder is normalized to produce the desired grain structure in the steel. Following this operation the cylinder is shot blasted, and both necks finished to the required size in a special horizontal boring mill.

Fifty lengths of pipe, fabricated into storage cylinders, arranged in five lines of eight units, four on each side of a manifold, were used in the Kankakee installation, and 160 similar units will be required at Evanston, Ill. Each unit, on an average, has an internal volume of 109.66 cu. ft. and is capable of storing approximately 30,000 cu. ft. of natural gas. Of particular interest to companies using these storage units is the compressibility factor of natural gas, which shows maximum deviation from the laws of perfect gases near the pressure of 2,240 psi. at which the gas is stored. Whereas approximately 160 cu. ft. of a perfect gas could be stored. Forty lengths of pipe are considered sufficient for storing 1,000,000 cu. ft.

It is expected that underground high-pressure pipe storage units will meet a long-felt need. Should failure of a single pipe occur, it will not affect adjacent units and further, a unit may be taken out of service for inspection or repair without disturbing the remainder. Being underground, no aviation hazards are involved, nor are the storage units affected by storms or rapidly fluctuating temperature conditions. Practically any size storage unit can be assembled as desired and a high percentage of the stored gas is instantly available at distribution pressure. It is not necessary to provide high-capacity compressing equipment for storing the gas as this can be done over a period of time since the facilities are primarily intended for emergency use only. Single pipe storage units weigh only about 5,000 lb. apiece before coating and may be easily handled and installed without the use of special equipment in the field.

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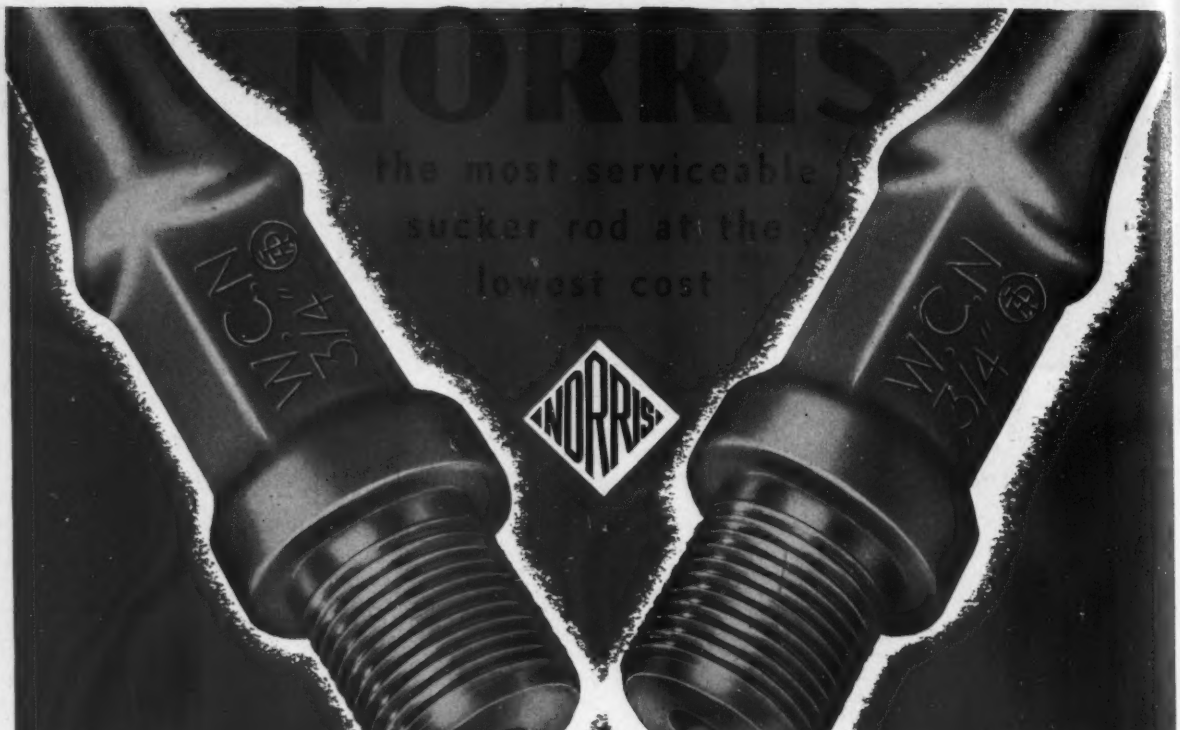

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NORRIS Quality Sucker Rods are manufactured in four different types to perform perfectly under the varied conditions encountered in any pumping job. Experience covering 65 years of oilfield service is built into NORRIS Quality Sucker Rods. Manufactured in the Sucker Rod Plant, devoted entirely to this one product, each of the 25 and 30 foot lengths is subjected to precise inspections, forged and threaded to exact A.P.I. specifications. All NORRIS rods are fully normalized and heat treated. All have more than the customary load demand to insure long, satisfactory service. NORRIS makes the type you need for the job ahead!

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High quality, basic open hearth, close grained carbon steel. Fully normalized. A.P.I. specifications. Box and Pin and Double Pin types. For medium Pumping duty.

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Very high grade, basic open hearth carbon manganese steel. Fully normalized. A.P.I. specifications. Box and Pin and Double Pin Types. For heavy pumping duty.

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Selected nickel moly alloy of great strength, ductility and toughness. Definite corrosion resistance. Fully normalized and tempered. A.P.I. specifications, Double Pin type. For heavy pumping duty of corrosive crudes.

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HIGH NICKEL MOLY

Selected high nickel moly alloy with extra resistance to shock and corrosion fatigue, combined with strength and ductility. Fully normalized and tempered. A.P.I. specifications. Double Pin type. For heavy pumping duty of highly corrosive crudes.

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Exploration and Drilling

Important Strike in Crockett County

THE Sinclair Prairie Oil Co.-Atlantic Refining Co. joint venture on a block of 4,120 acres in Crockett County, Texas, on University Lands obtained after spirited bidding for a bonus of over $1,100,000, looked like a good gamble this week, after a series of eight drill-stem tests at their University 1-66, about 8½ miles northeast of the Todd Deep field. The play was based on seismograph evidence of a pre-Permian structure that looked good to a number of companies and the resulting bids were high.

A reasonable interpretation of the Ellenburger drill-stem-test data given below would indicate around 100 ft. of gas and gas-condensate column on top of a 90-110-ft. oil column, the oil column probably resting on a tight section of the Ellenburger, with water found below the tight lime. If subsequent development should prove this to be true, the only water drive will be a flank drive up structure. With gas and gas-condensate on top and flank water drive only to contend with, flowing life of the wells should be prolonged.

Under such circumstances, estimates of ultimate recovery might well range between 200 and 300 bbl. per acre foot, or say 20,000 to 30,000 bbl. per acre, if the average for the field should check with the preliminary evidence of the drill-stem tests of the discovery well.

After topping the Ellenburger at 7,396 ft., the following drill-stem tests were made, all with ⅝-in. choke on the tool.

No. 1 at 7,390-7,438 ft. Gas to surface in 1 minute, estimated rate of flow 10,000,000 cu. ft. Recovered 60 ft. of condensate when pipe pulled.

No. 2 at 7,438-76 ft. Gas in 1 minute, estimated rate of flow 2,120,000 cu. ft.; mud to surface in 11 minutes. Recovered 50 ft. of condensate when pipe pulled.

No. 3 at 7,476-7,512 ft. Gas in 50 seconds, estimated 1,650,000 cu. ft. flow, condensate in 18½ minutes, flowed 2½ bbl. of 49.2°-gravity condensate into separator, recovered 130 ft. of condensate in pipe. Flowing pressure 1,320 psi., bottom-hole pressure 3,200 psi.

No. 4 at 7,512-62 ft. Gas in 50 seconds, estimated flow rate 2,000,000 cu. ft., mud in 7 minutes, flowed 40 bbl. 44.8°-gravity oil into tanks in 30 minutes, recovered 450 ft. oil in pipe. Gas-oil ratio 1,040 cu. ft.

No. 5 at 7,562-7,608 ft. Gas in 1 minute, 10 seconds, flow rate 580,000 cu. ft., mud in 26 minutes, flowed 12½ bbl. oil in 1 hour, recovered 870 ft. oil and 30 ft. of wash water in pipe.

No. 6 at 7,598-7,608 ft. Gas in 6 minutes, slight blow of gas for 54 minutes. Recovered 30 ft. of mud, no water, in pipe.

No. 7 at 7,608-40 ft. Gas in 6 minutes, strong flow of gas for 54 minutes. Recovered 30 ft. of mud, no water, in pipe.

No. 8 at 7,638-80 ft. (total depth). Gas in 45 minutes, recovered 450 ft. of mud and 3,450 ft. of sulfur water in pipe.

Operators plan to set pipe on bottom around 7,680 ft., and perforate about a 40-ft. section opposite what the electric logs and drill-stem tests indicate will be the best oil pay. Every effort will be made to keep the gas and gas-condensate column excluded, in order to conserve the reservoir energy.

EASTERN TEXAS

Delta Co. Announces Paluxy Test Location

DALLAS.—Delta Drilling Co., Tyler, Tex., this week announced location for its long-planned Paluxy exploratory test, 5 miles northwest of Tyler in the Hezekia George Survey, and on the H. Y. Jackson tract, in Smith County. Proposed depth was said to be 8,000 ft. Companies said to be supporting the test include Gulf Oil Corp., Stanolind Oil & Gas Co., Sinclair Prairie Oil Co., Superior Oil Corp., and R. W. Fair, of Tyler.

Stanolind and Continental's Harrison County wildcat, the 1 Slaughter, 10 miles northeast of Marshall, reported top of the Cotton Valley at 8,185 ft., and was drilling ahead below 8,341 ft., with no shows or porosity. Operators said the well was out of the Travis Peak ahead of expectations, thus placing it high on the Cotton Valley compared with an old test several miles to the south.

In Wood County, 3¾ miles east of Yantis, Humble Oil & Refining Co. 1 Rio Oil Corp. had total depth at 8,500 ft., and stopped to run electric survey. It was said the well would be plugged back for completion attempts in the Rodessa gas section, if no deep shows are indicated. In Anderson County, 3 miles east of Blackfoot, Sanders & Murchison 1 R. F. Broadway was drilling ahead below 9,255 ft. in limestone and shale, after running electric survey at 9,218 ft.

EAST TEXAS WILDCAT FAILURES

Angelina County: Traders Oil Co. 1 H. D. LaGrone, A. Flores League, 5 mi. N Lufkin, dry, TD 975 ft. in sand.

Cherokee County: Delta Drilling Co. et al 1 J. L. Bailey, John H. Russell Sur., 1¾ mi. N Ponta, dry, TD 4,392 ft., sample tops: Pecan 3,325 ft., Austin 4,140 ft., Woodbine 4,325-27 ft.

Van Zandt County: Humble Oil & Refining Co. 1 H. E. McCord, Leander Smith Sur., 4 mi. W and slightly S Canton, dry, TD 8,513 ft. in hard, sandy shale, Austin 3,352 ft., Woodbine 4,382 ft., Comanche 5,102 ft., Woodbine had salt water, no shows.

TEXAS GULF COAST

Deep Tamina Wildcat Being Swabbed for Test

HOUSTON.—Humble Oil & Refining Co. and Continental Oil Co. 1 James C. Baldwin et al, wildcat in the Tamina area of Montgomery County, Walker County School Land Survey, Abstract 599, L. McWilliams subdivision, continues to swab for a test from record deep sands. Last reports showed the pipe was perforated with 144 shots from 14,300-334 ft., for a test where it failed to flow and was being swabbed after running 2½-in. tubing to 14,295 ft. Top of the cement is 14,355 ft., and total depth of the hole is 14,382 ft. If this test is successful, it will be the world's deepest production. The 5½-in. liner is cemented at 14,382 ft.

Ralph H. Grant and Jimmie P. Petkas will complete their wildcat in Wharton County as a gas discovery and will use it for further exploration in the area. The test is the M. F. Rooker 1 in the B. B. Pearce Survey, Abstract 318, 4 miles northeast of Gobbler Creek discovery production, and 4 miles northwest of deep discovery production in the South Hutchins area. Total depth is 5,812 ft. in the Vicksburg, and 5½-in. pipe is cemented at 4,200 ft. On a test through perforations at 4,049-55 ft. in sands at 4,049-66 ft., it developed 1,500 psi. working pressure in 5 minutes, and flowed gas with some condensate through a ⅛-in. choke with 1,700 psi. pressure, no water in flow. A cement plug was set in the hole and pipe was perforated from 3,199-3,211 ft. where a drill-stem test developed 80 psi. working pressure and showed a small amount of gas and some water. Cement plug is now being drilled out, and the well will be completed as a discovery gasser in the 4,000-ft. sands.

The Texas Co. 1 Drushel et al, new gas field discovery 3 miles west of Edna gas field, in Jackson County, gaged 8,000,000 cu. ft. gas per day on open flow, through perforations just above the plugged-back depth of 2,580 ft.

A new oil field is indicated in Goliad County, 8,500 ft. northwest of Weser field. Sunray Oil Corp. 1 George H. Brandt, in

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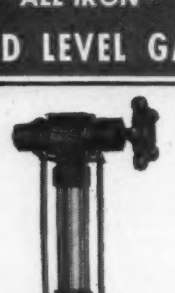

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the Thomas Hancock Survey, is coring ahead below 7,734 ft. after drill-stem test in a Wilcox sand topped at 7,707 ft. recovered 31°-gravity oil. First test at 7,709-15 ft., through ¼-in. chokes top and bottom, with 500-ft. water cushion, developed 130 psi. working pressure and flowed oil and water cushion for 4 minutes, after tool was closed for 1 hour and 10 minutes after a 30-minute test, and put on a ⅝-in. top choke. Recovery was 1,220 ft. of 31.5°-gravity pipe-line oil and trace of mud. Bottom-hole pressure was 3,050 psi. A 15-minute drill-stem test at 7,715-25 ft. recovered 4,135 ft. of pipe-line oil plus the 500-ft. water cushion and 215 ft. of salt water. Bottom-hole pressure was 3,525 psi. open and 3,525 psi. closed.

Jack W. Frazier has opened a new gas-producing area near Louise oil field and Karsten's discovery gas production north of Louise field, Wharton County. The 1 Fred Swenson, an abandoned hole drilled by W. S. Boyle in 1944, old total depth 6,012 ft., was taken over by Frazier. Hole was cleaned out to the 5,400-ft. level, and liner perforated with 33 shots from 4,703-11 ft. where it flowed gas through a 3/32-in. choke with 2,000 psi. pressure on the tubing. No water in the flow. It is now shut in waiting on potential test.

There were 37 new locations reported this week with 7 wildcats, 2 in Wharton, 1 each in Bee, Brazoria, Chambers, Fort Bend, and Live Oak counties. Two new pays were opened, one gas in Matagorda Bay, Calhoun County, and one oil in Lolita field, Jackson County. One gas pool discovery in Refugio County. Eight wildcats were dry, two in Bee County, and one each in Chambers, Fayette, Fort Bend, Liberty, Montgomery, and San Jacinto counties.

TEXAS GULF COAST SUCCESSFUL WILDCATS

Calhoun County: New gas pay, Matagorda Bay—Texas Co. 1 State Tr. 130, in State of Texas Tr. 130 in Matagorda Bay, 5½ mi. N-NE of Port O'Connor, TD 5,780 ft., perf. 4,622-30 ft., IP: 17,500,000 cu. ft. gas per day on open flow, no water.

Jackson County: New oil pay, Lolita field—Humble 1-D Four Way Ranch, in I&GN Sur. 11, ½ mi. NE of previous production, top pay 7,865 ft., TD 8,556 ft., perf. 7,865-71 ft., IP: 88 bbl. oil per day through ⅛-in. choke, gas-oil ratio 8,193, TP 2,550 psi., casing sealed, gravity 42.4°.

Refugio County: New gas pool, LaGloria Corp. and Skelly 2 Jamie Hynes, John Malone Sur., 3 mi. N of Refugio, top pay 6,019 ft., TD 7,212 ft., perf. 6,019-29 ft., IP: 120,000,000 cu. ft. gas per day on open flow, SIP 2,287 psi., no water.

TEXAS GULF COAST WILDCAT FAILURES

Bee County: Dirks Bros. 1 T. W. Caswell, in Thos. Mancha Sur., 8 mi. NW of Pettus, dry, TD 2,773 ft.

Tide Water Assoc. Oil Co. 1 W. R. Boothe, in Asa Walker Sur., 1¾ mi. NE of Mineral, dry, TD 7,650 ft.

Chambers County: Standard Oil of Texas 2-201 State-Galveston Bay, East Red Fish Reef area, in Sec. 201, Galveston Bay, dry, TD 9,636 ft.

Fayette County: H. C. Starkey 1 H. W. Anderson and W. B. Pearce, in Belden Sur., 3 mi. W of Cistern field production, dry, TD 3,024 ft.

Fort Bend County: Jack W. Frazier 1 Cinco Ranch, in I&GN Sur., 5¼ mi. NW of Clodine field, dry, TD 7,820 ft.

Liberty County: Humble 1 J. M. Rich et al, East Hankamer area, in W. B. Reed Sur., 7½ mi. SE of Devers townsite, dry, TD 8,500 ft.

Montgomery County: Moran Oil Co. 2 Hutchins-Sealy National Bank, in Jonathan C. Pitts Sur., dry, TD 5,012 ft.

San Jacinto County: Salt Dome Oil Corp. et al 1 E. K. Sowash, in J. M. de la Garza Sur., 8½ mi. SW Evergreen townsite, dry, TD 8,017 ft.

SOUTHWEST TEXAS

Potential Kleberg County Discovery Being Completed

CORPUS CHRISTI.—Stanolind Oil & Gas Co. 2 J. O. Johnson, potential oil-field discovery in Kleberg County, approximately 3½ miles southeast of Kingsville and 1½ miles northwest of the Ricardo field, flowed at the rate of 95.5 bbl. of 44°-gravity oil per day on initial test through perforations at 6,040-46 ft., using ¼-in. and 3/16-in. chokes, on 5½-hour drill-stem test, 1,050 psi. working pressure. Gas-oil ratio 5,400. These perforations were squeezed and new shots made in the same sand in an attempt to cut down the high gas-oil ratio and make a commercial oil completion. The well previously had tested gas, oil, and salt water from a section at 6,186-6,204 ft., best test being a recovery of 1,530 ft. of 36°-gravity oil and 210 ft. of salt water on drill-stem test in perforations at 6,188-94 ft.

A new condensate pay has been opened at Wilson field in Jim Wells County by Magnolia Petroleum Co. 2 Russell. Total depth is 8,500 ft., and on potential test flowed 3,632,000 cu. ft. of gas and 101 bbl. of condensate per day through an 11/32-in. choke, ratio 37,971, tubing pressure 1,734 psi. Shut-in pressure 2,876 psi., gravity 56.9°. Production is through perforations at 7,158-70 ft.

Jay Simmons 1 First National Bank of Mission, in northeastern Starr County, approximately 3 miles north of the La Reforma field, and 2½ miles southeast of the new southeast flank Kelsey-Deep production, is opening a new oil field. It is now being dual-completed after having flowed oil at the rate of 6 bbl. per hour through perforations at 6,112-17 ft., and at the rate of 8 bbl. per hour through per-

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forations at 6,422-27 ft. Total depth is 7,505 ft., and 5½-in. casing set to 6,504 ft. for the completion.

A new oil pay for South Haldeman pool in Jim Wells County has been opened by Sunray Oil Corp. 1-D C. T. Hewitt, in R. P. Haldeman Subdivision of Seeligson Ranch. Drilled to a total depth of 6,000 ft., with new pay perforated at 4,205-11 ft., top of pay 4,195 ft., on potential test flowed 124 bbl. of oil per day through 5/32-in. choke, gas-oil ratio 710. Gravity 43.9°, with tubing pressure 320 psi., casing pressure 810 psi.

Magnolia Petroleum Co. is still pumping in mud to get under control its 101 A. A. Seeligson, at Seeligson field, Jim Wells-Kleberg counties. This well has charged the shallow sands with gas and caused the nearby 14 Seeligson to crater and also endangered other nearby wells. The 101 Seeligson started kicking from sand logged at 6,165-75 ft., and the blowout preventers were closed. Drill pipe became stuck and the well bridged over, apparently at the bottom of the surface pipe, but gas pressure then charged the shallower sands below the surface pipe, and blew out around the surface pipe of the other well. All wells within a ½-mile radius were killed with mud to protect them against possible fire or other trouble.

There were 40 new locations reported this week with 7 being wildcats, 2 in Webb and 1 each in Duval, Hidalgo, McMullen, Starr, and Willacy counties. Two new pools were opened, oil-gas pool in Aransas County, gas pool in Duval, and one new oil pay in South Haldeman pool, and a condensate pay in Wilson pool, Jim Wells County. Six wildcats were dry, one each in Bexar, Caldwell, Duval, Guadalupe, San Patricio and Willacy counties.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Aransas County: New oil-gas pool, Live Oak Peninsula—William Herbert Hunt Trust Est. and Geo. W. Graham 1 Spencer-Kent-Grane, in C. O. D. Gilliland Sur., 4½ mi. N-NE of Rockport, dual completion, top pay 7,048 ft., TD 8,370 ft., perf. 7,058-65 ft., IP: 5,050,000 cu. ft. gas per day on open flow with condensate. Top pay 7,126 ft., perf. 7,126-36 ft., IP: 186 bbl. oil per day through 9/64-in. choke, gas-oil ratio 857, TP 120 psi., casing sealed, gravity 43.2°, no water.

Duval County: New gas pool—R. Thos. McDermott 1 Casper Guerra, "Severiano," in J. Poitevent Survey 167, 15 mi. N-NE of Bruni, top pay 2,596 ft., perf. 2,540-45 ft., IP: 5,250,000 cu. ft. dry gas per day on open flow, shut-in pressure 690 psi., no water.

Jim Wells County: New oil pay, South Haldeman field—Sunray Oil Corp. 1-D C. T. Hewitt, in R. P. Handeman Subd. of Seeligson Ranch, 4 mi. NW of Premont, top pay 4,195 ft., TD 6,000 ft. perf. 4,205-11 ft., IP: 124 bbl. oil per day through 5/32-in. choke, gas-oil ratio 710, TP 320 psi., CP 810 psi., gravity 43.9°, no water.

New condensate pay, Wilson pool—Magnolia Pet. Co. 2 N. L. Russell, in Lot 11, Ed. C. Lassiter Subd., El Paisano Grant, 5 mi. NE of Falfurrias, top pay 7,158 ft., TD 8,500 ft., perf. 7,158-70 ft., IP: 3,632,000 cu. ft. gas per day and 101 bbl. of condensate per day through 11/32-in. choke, ratio 37,971, TP 1,734 psi., SIP 2,876 psi., gravity 56.9°, 1.45 per cent water.

SOUTHWEST TEXAS WILDCAT FAILURES

Bexar County: J. E. Mowinckle 1 M. B. Rarin, in M. Seguin Sur., 4 mi. SW of Elmendorf, near Wilson County line, dry, TD 3,617 ft. in Edwards lime.

Caldwell County: Wiegand Bros. Drlg. Co. 1 O. O. Perry, Tenney Creek area in Wm. House Sur. 43, dry, TD 2,971 ft.

Duval County: Edwin B. Cox and Jake L. Hamon and Geo. H. Coates 1-B W. R. Peters Est., in BS&F Sur. 789, 2 mi. W of Peters field, dry, TD 2,858 ft.

Guadalupe County: Cecil Hagen et al 1 H. Calvert, in John Ussery Sur., 4 mi. NE of Seguin, dry, TD 4,390 ft.

San Patricio County: Bridwell Oil Co. 1-A M. I. Beall, in Delgado Grant, ¾ mi. N of Willmann field, dry, TD 4,558 ft.

Willacy County: Humble 1 Sauz Ranch-Nopel Pasture, in San Juan de Carricitos Grant, 4 mi. E of Willamar field, dry, TD 11,189 ft.

MICHIGAN

Garfield-Newaygo Gets Six Good Producers

SAGINAW.—Six more Garfield-Newaygo wells flowing at daily rates of from 100 to 2,000 bbl. per day marked the week in Michigan oil fields. Completions totaled 23, 18 new locations were reported. The completions included 11 oil producers, 8 gas wells, and 4 dry holes, all wildcats. Combined initial potential was 6,640 bbl. of oil, 57,000,000 cu. ft. of gas. In addition to the Newaygo oil wells, producers were developed in Kent, Oceana, and Montcalm counties. The gas wells are in Clare and Mecosta counties. Wildcat failures included one operation in Grant-Newaygo drilled in an effort at Garfield extension.

MICHIGAN WILDCAT FAILURES

Allegan County, Heath Township: Ford Oil Co. 1 Thomas & Cave, NW SE SE 21-3n-14w, dry in Traverse limestone, TD 1,450 ft.

Dorr Township: Michigan Devonian Petroleum Co. 1 H. J. & H. O. Kloska, NE SE NE 34-4n-12w, dry in Traverse limestone, TD 1,658 ft.

Kent County, Cannon Township: P. K. Degenther 1 J. & J. Ellens, SW SW SW 32-8n-10w, dry in Traverse limestone, TD 2,288 ft.

Newaygo County, Grant Township: Merrill Drilling Co. 1 R. M. & J. A. Longcore, SE SE SW 25-11n-12w, dry in Dundee, TD 2,957.

CANADIAN FIELDS

Fifth Leduc Well Blows In, Producing 157 Bbl.

CHATHAM.—In Leduc field southwest of Edmonton, Imperial 5, LSD 8, 21-50-26w4, blew in while drilling plug in Devonian limestone around 5,100 ft. After producing 267 bbl. of 39°-gravity oil the well was shut in to build up pressure. The same thing happened at Imperial 3, now a steady producer of about 157 bbl. daily under choke. After a short period, No. 5 returned to production and is averaging close to the other four producers. Recent figures show Imperial 1 with 168 bbl., No. 2 with 243 bbl., No. 3 with 137, and No. 4 with 179 bbl., all under restricted flow. The new completion offsets the discovery well to the west.

Five other wells in the immediate field are nearing completion. Okalta-Leduc 1, LSD 13, 7-50-25w4, is below 4,764 ft. Globe-Leduc West 2, LSD 9, 34-50-26w4, is below 4,630 ft. after taking first drill-stem test at 4,538 ft. B. A. Pyrcz 1, LSD 12, 25-50-26w4, got Devonian at 4,309 ft. and a core with slight saturation at 4,423-89 ft., and is deepening below 4,630 ft. Imperial 6, LSD 1, 22-50-26w4, is below 5,283 ft. with production expected around 5,340 ft. Imperial 7, LSD 4, 15-50-26w4, is drilling and coring below 5,103 ft.

South of the field, McColl-Frontenac 14-14 Wizard Lake, LSD 14, 14-48-27w4, is coring below 5,175 ft. McColl-Frontenac Bigstone Creek, LSD 1, 20-46-26we, is below 5,168 ft. and McColl-Frontenac East Wetaskiwin, LSD 3, 22-46-23w4, is below 5,000 ft., both coring. Formations in this area appear deeper than in the main field.

New locations in the main field are Imperial 11, LSD 9, 21-50-26w4, and Imperial 12 in LSD 12, 22-50-26w. Five tests are drilling at shallower depths and there are six additional locations.

Jumping Pound.—Shell Oil 5-7-1, LSD 5, 7-25-4w5, deepening in Banff shales below the Madison limestone to test the Devonian formation blew out of control at 11,865 ft. The well blew wild for 44 hours before a blowout preventer could be installed to resume deepening. Part of the flow is believed to have come from a previous strike in the Madison.

Northern Alberta.—In northern Alberta, joint tests by Anglo Canadian Oil Co., Home Oils, and Calgary & Edmonton Corp. in the Elk Lake area have been discontinued, following completion of several shallow gassers and the proving of deep salt best. Beaver Hill Lake 2, LSD 11, 11-50-17w4, has been abandoned at 5,558 ft. A new joint test is being started in the Wabamum Lake district.

Pakowki Lake.—In the Pakowki Lake-Manyberries area, two more McColl-Frontenac Oil Co. and Union Oil Co. joint tests, 13-5 in LSD 13, 5-6-7w4, at 3,308 ft. and

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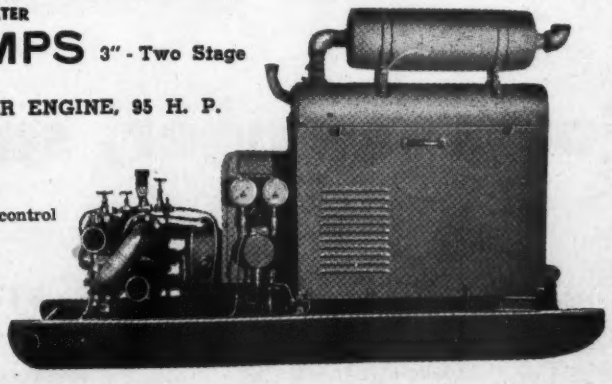

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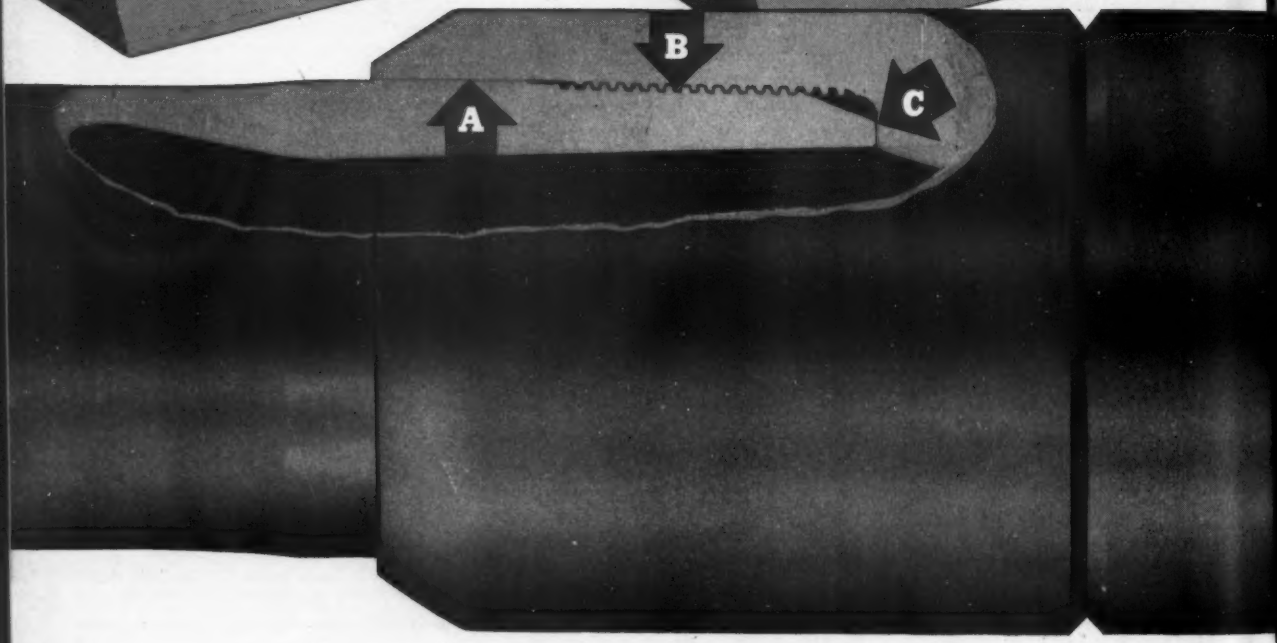

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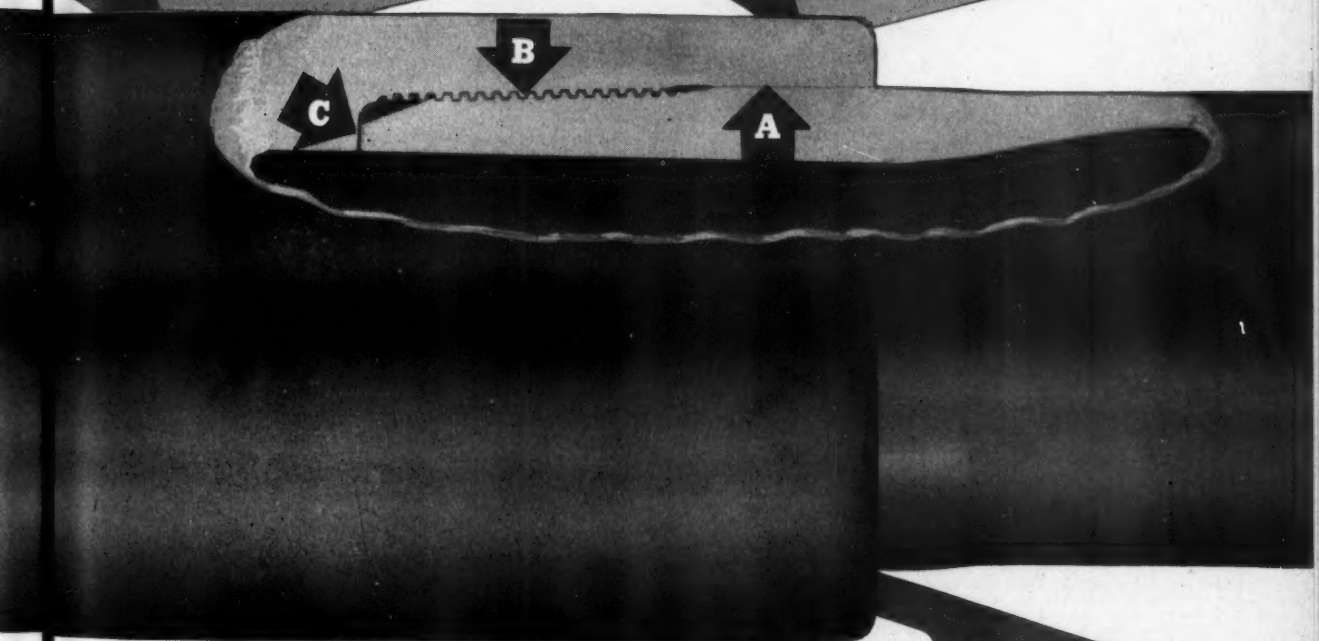

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7C-32, LSD 7, 32-3-8w4, at 2,103 ft., have been abandoned. McColl-Union 7-13, LSD 7, 13-5-6w4, finished at 2,703 ft. with 30,000,000 cu. ft. open flow from the Bow Island sand. McColl-Union 7C-6, LSD 7, 6-5-5w4, coring below 2,663 ft., looks like another large gasser.

N. CENTRAL TEXAS

Baylor County Shallow Production Is Indicated

WICHITA FALLS.—New shallow production in Baylor County, 7 miles southwest of Dundee, was indicated at P. P. Langford 1 Cowan, Block 91, T&NO Survey. Canyon reef limestone was topped at 2,815 ft., with oil shows at 2,820-36 ft. A 1-hour drill-stem test of that section recovered some free oil and 25 ft. of oil-cut drilling mud. Electric survey was run and casing set at 2,820 ft. for production tests.

Said to be the largest Gunsight well completed in North Texas, Fortex Oil Corp. et al 2 Wilson, Block 11, ATNCL Survey, 4 miles south of Anarene in Archer County, made a natural flow of 550 to 600 bbl. of oil a day from pay at 1,602-05 ft. This well may serve to revive activity in the Benson area, which was one of the most active spots in North Texas for the first quarter of the year. Currently, drilling is running high in the old Archer County Regular field, to the southeast of Benson, where weekly oil completions have averaged around six for some time, plus an equal number of dry holes.

Third oil pay for Kendall field of southwestern Young County, northwest of Eliasville, was reported at Warren Oil Corp. 1-A Deats, Block 3, BS&F Survey, which flowed 109.7 bbl. of 43°-gravity oil in 24 hours through 16/64-in. choke from Mississippi limestone at 4,549-61 ft. Other pay zones are the Bend conglomerate and Strawn sand.

In Montague County, C. J. Simpson 1 S. W. Heard, between Winder and Hildreth fields, was running casing to test oil shows and saturation in Caddo limestone at 6,066-6,132 ft. East of Belcherville, Bay Petroleum Co. 1 G. R. Reevs perforated in conglomerate at 5,151-57 ft., swabbed down but recovered only 100 ft. of oil plus a like amount of salt water. Operators planned to abandon the test.

Exploration & Drilling Co., Tulsa, last week staked location for a 6,600-ft. rotary wildcat 3 miles southeast of Sweetwater, in northeast Nolan County. It is the 1 R. M. Simmons, Section 56, Block 21, T&P Survey. Proposed depth is considered sufficient to test the Strawn. Location is 2½ miles southwest of Sohio Petroleum Co. 1 Irl Faver, which was dry at 5,836 ft., after producing some oil from the Strawn.

NORTH TEXAS WILDCAT FAILURES

Perry Browning 1 E. A. Maag, T. P. Martin Sur., A-758, ½ mi. W Huff Station, dry, TD 1,597 ft.

Grace & Grace 1 A. B. Edwards, Blk. 15, Geo. Bruner Sur., A-8, 2½ mi. NW Scotland, dry, TD 5,901 ft., Caddo 5,212 ft., DST 5,249-79 ft. recovered mud with odor of oil and gas, Ellenburger 5,750 ft.

G. E. Kadane & Sons 2 W. T. Waggoner "A," Sec. 1, H&TC Sur., 3 mi. N Dundee, dry, TD 4,341 ft., sand with saturation 4,315-17 ft., sand with show of oil 4,319-36 ft.

Cooke County: Scott Bros. 1 John Felderhoff, John Stump Sur., A-1,497, 7½ mi. S Muenster, dry, TD 3,108 ft., sand with show of oil 1,630-50 ft.

Denton County: J. J. Tyrell et al 1 Hosey, H. Turner Sur., A-1,249, 3 mi. SW Lewisville, dry, TD 2,525 ft., sand with odor of gas 1,515-40 ft.

Montague County: D. H. Bolin 1 P. Howard, Finis Robertson Sur., A-620, 14 mi. NE Nocona, dry, TD 2,020 ft., sand with show of oil 1,218 ft., bailed rainbow of oil from sand at 851-60 ft.

Honolulu Oil Corp. 1 A. Durham, S. W. Moore Sur., A-1,243, 4 mi. NE Bonita, dry, TD 4,345 ft., sand with show of oil 2,556-61 ft., DST recovered oil-cut mud, sored sand with oil shows at 3,438-62, 4,087-96 ft.

Wichita County: Trout-Hansen Production Co. 1 P. G. Krohn, Sec. 20, H&GN Sur., A-410, 6 mi. SE Electra, dry, TD 1,593 ft.

APPALACHIAN FIELD

Williamsburg Wildcat Shut Down for Test

PITTSBURGH.—In Williamsburg district, Greenbrier County, West Virginia, The Texas Co. shut down at 8,120 ft. in its rotary wildcat on G. R. Dean tract and cleaned out for test. With a packer set at 7,409 ft., gas from the Newburg (7,458-7,550 ft.) and the Clinton sand (top at 7,988 ft.) tested 103,000,000 cu. ft. in 1 hour. The Oriskany also showed gas in a drill-stem test. That formation was logged at 6,538-72 ft.

Elevation of the new test of Wm. E. Snee, Orville Eberly et al on Virginia Cuppett farm on Briery anticline in Portland district, Preston County, is 2,137 ft. and is 5.2 miles south and 3.65 miles west. The rig is completed and drilling will start within the week.

New locations totaled 14. They were in Washington district, Calhoun County; Union district, Clay County; Quinnimont district, Fayette County; Ravenswood and Ripley districts, Jackson County; Logan district, Logan County; Mannington & Union districts, Marion County; Lafayette district, Pleasants County; Clay and Murphy districts, Ritchie County; Warren district, Upshur County; Butler district, Wayne County.

In Harvey district, Mingo County, Boyd Oil & Gas Co. completed 19 Red Jacket Consolidated C & C Co., good for 7 bbl. initial from the Big Lime, TD 1,630 ft.

Completions in southwest Pennsylvania were of routine nature. New locations totaled four and in Madison, Manor, and South Buffalo Townships, Armstrong County, and in Beaver Township, Jefferson County.

WEST VIRGINIA SUCCESSFUL WILDCATS

Nicholas County, Jefferson district: Columbian Carbon Co. 947 H. J. Summers, 3,468,000 cu. ft. gas after acidizing, total depth 1,658 ft. Big Lime topped 1,575 ft., rock pressure 520 psi., 16 hours.

Raleigh County, Trap Hill district: Hope Natural Gas Co. 9,126 H. G. Farmer, 1,356,000 cu. ft. gas after shot, total depth 2,106 ft. Ravencliff sand 1,629-71 ft., Maxton 2,076 ft., gas 2,082-90 ft.

WEST VIRGINIA UNSUCCESSFUL WILDCAT

Fayette County, Nuttall district: Columbian Carbon Co. 943 Nuttall Hrs., dry through Big Lime, toal depth 2,980 ft.

CALIFORNIA

Prospective Discovery Drills Ahead at 10,574 Ft.

LOS ANGELES.—Basin Oil Co. continued to drill ahead at the close of the week at its prospective wildcat discovery in the Inglewood area, the 1 City of Inglewood, 28-2s-14w. Earlier in the week, operators perforated the 7-in. casing at 10,477-86 ft. and 10,493-10,502 ft. for a formation test. During the test the well blew considerable oil and gas and no salt water. The test was halted at the end of 40 minutes, however, when a valve blew out, and operators decided to deepen the well in an attempt to increase recovery. Present depth is 10,574 ft.

Meanwhile, Macco Oil Corp. 2 Macco-Beloil Fee, 28-2s-14w, in the Potrero field and about 4,800 ft. north of the Basin venture, continues to drill ahead with occasional spot coring at a depth of 9,056 ft. The eighth Callendar sand is the production goal of this well, and electric log correlations indicate that it is running considerably higher structurally than the 1 City of Inglewood.

Standard Oil Co.'s deep wildcat in the Kettleman Hills Middle Dome area has reached a depth of 9,358 ft. in redrill operations. This test, the 73-30V, located in 30-23s-19e, originally went to a total depth of 12,389 ft. where good production was established, indicating an important discovery. A fishing job, however, necessitated redrilling the well, and showings so far encountered correspond with those uncovered in the original try, which topped the Eocene at 12,070 ft.

The Middle Dome of the Kettleman Hills has never produced oil in important quantities, and what little production was developed from shallow horizons played out many years ago. If Standard's discovery can be successfully completed, it will probably mean an important new reservoir of crude for the state.

Signal Petroleum Co. announced last week that it is planning to start a new wildcat venture in the near future on a 250-acre tract in 28-2n-21w. Location is approximately 1½ miles north of the Oxnard field and east of Standard's recent discovery in the area. Company geologists say that production will be sought in the Miocene, and that the venture is believed to be on an areal structural high. It is approximately 600 ft. east of a test well drilled over 20 years ago which has since oozed oil and gas.

Current reports from Cal Oil & Gas Co.'s wildcat try in the Temblor area of Kern County, the 1 Calumet-Cal, 30-29s-21e, indicate that the well has cored more than 450 ft. of promising oil formations. Sidewall samples, cores and electric log indicate that the intervals at 810-1,110 ft., 1,570-1,640 ft., and 1,750-1,855 ft. are made up of saturated fractured shale. Operators presently are coring at 2,000 ft. and plan to halt the well soon so that casing may be

LEGAL

CALL FOR BIDS. To sell royalty crude oil accruing to the United States. Sealed proposals, in duplicate, will be received in the office of the Director of the Geological Survey, Room 5244 Federal Works Agency Building, Washington 25, D. C., on or before noon, d.s.t., August 7, 1947, for the sale of certain royalty crude oil in three separate items accruing to the United States from Federal lands in the Rangely field, Colorado. No bid received after the time fixed for submitting bids will be considered. Bids will be publicly opened at 2:00 p.m., d.s.t., on the same day. Contracts for the royalty oil will be for a term of 3 years beginning the first day of the calendar month following execution by the Secretary of the Interior. The monthly royalty oil accruals offered for sale amount to about 75,000 barrels of Weber and Shinarump oil of about 35° A.P.I. gravity. Specifications on the quantities of crude oil offered for sale, the form of bids, the form of contract, and the conditions with respect to bond requirements, deliveries, volume measurements, gravity determinations, and other details relating to the call for bids should be obtained from the Director, Geological Survey, U. S. Department of the Interior, Washington 25, D. C., or the Oil and Gas Supervisor, U. S. Geological Survey, P. O. Box 400 (305 Federal Building), Casper, Wyoming. Sealed bids must be submitted to the Director of the Geological Survey, U. S. Department of the Interior, Washington 25, D. C., pursuant to the specifications, the envelope to be marked plainly "Bid on Rangely, Colorado, Royalty Oil—not to be opened before noon, d.s.t., August 7, 1947." Girard Davidson, Assistant Secretary of the Interior.

run preparatory to making thorough tests of all zones.

CALIFORNIA SUCCESSFUL WILDCAT

Kern County, Elk Hills area: Standard Oil Co. of Calif. 16-35R U.O.N.P.R., 35-30s-23e, pumped 56 bbl. of oil per day, gravity 34.9°, 15.0 cut, elev. 1,290 ft., TD 3,560 ft.

CALIFORNIA WILDCAT FAILURES

Fresno County, Panoche Creek area: Seaboard Oil Co. 85-36 Lillis, 36-15s-12e, dry, elev. 823 ft., Tumey 2,145 ft., Hondo 3,500 ft., TD 6,059 ft.

Kern County, Edison area: United Exploration Co. 26-30s-29e, dry, elev. 601 ft., TD 2,915 ft.

Miramonte area: Pacific Western Oil Corp. 1 National Royalties, 5-26s-22e, dry, elev. 235 ft., TD 16,668 ft.

McKittrick area: The Texas Co. 1 Nacirema, 6-30s-22e, dry, elev. 772 ft., Amnicola 1,527 ft., TD 1,570 ft.

Temblor area: Miller & York 1 F. O. B., 31-29s-21e, dry, TD 438 ft.

Ventura County, Del Valle area: Standard Oil Co. of Calif. 1 Boobier, 15-4n-17w, dry, elev. 1,127 ft., TD 8,855 ft.

SOUTH LOUISIANA

World's Deepest Producer Indicated in Louisiana

NEW ORLEANS.—The world's deepest production was indicated at Queen Bess Island area of Jefferson Parish when The Texas Co. 1 Lafourche Basin Levee District, wildcat test, developed 4,000 psi. while flowing through a ½-in choke on drill-stem test of perforations at 13,916-918 ft. Total depth is 15,523 ft., with 5½-in. casing cemented to 13,998 ft. At present, the world's deepest production is Shell Oil Co., Inc. 3 Smith-State Unit 1 at Weeks Island in Iberia Parish. It produces 33°-gravity oil through perforations at 13,867-873 ft. and 13,878-888 ft., with total depth at 14,397 ft.

Magnolia Petroleum Co. 46 Cameron Meadow Land Co., on the south flank of Cameron Meadow field, Cameron Parish, is producing high-gravity oil from deep sands, and is the deepest oil production thus far for the area. Potential test has not been made but on an initial gage flowed 118.68 bbl. of 41.5°-gravity oil daily through a 6/64-in. choke with 3,240 psi. flowing pressure on the tubing. Gas ratio 6,939. Production is through perforations at 8,834-36 ft. Original total depth was 8,800 ft., but hole was plugged back and deviated in a southwesterly direction and present depth is 8,920 ft.

Production at Lake Hermitage field, Plaquemines Parish, has been extended 2,500 ft. westward by Gulf Refining Co. 17 Lafourche Basin Levee District in 10-18s-24e. This is also a new gas and condensate producing sand for the field. Drilled to a total depth of 12,091 ft., with 5½-in. casing cemented to 12,067 ft., this well gaged 91 bbl. of condensate along with 3,245,000 cu. ft. of gas through a 3/16-in. choke in 24 hours. Flowing pressure on tubing was 3,600 psi. Perforations are at 11,895-954 ft.

The deepest test drilled in Iowa field area of Calcasieu Parish, Magnolia Petroleum Co. 20 B. T. Wait has indicated a new deep high-pressure discovery. Total depth is 10,107 ft. in salt, and 5-in. liner is cemented near the total depth. A drill-stem test through perforations at 9,476-78 ft., using a 6/64-in. choke and ¼-in. choke, developed 1,900 psi. working pressure with mud and water cushion in the hole. After the well flowed the cushion, pressure increased to 5,200 psi. Tool was closed and pressure was bled down to 1,100 psi. and a recovery of gas and condensate was made. Production packer is now being set

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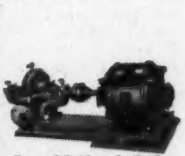

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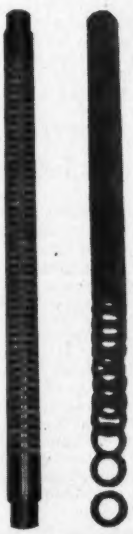

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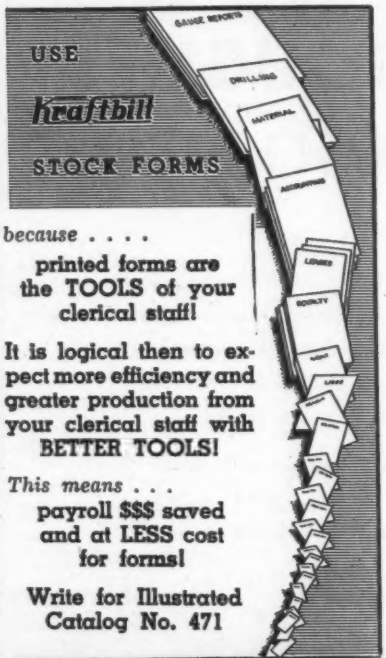

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for a flow test. On initial test through eight perforations at 9,838-48 ft. developed 2,300 psi. on a drill-stem test using ¼-in. and 6/64-in. chokes.

Sohio Petroleum Co. and Gulf Refining Co. 2 Walker et al, third oil producer for the Holmwood discovery area of Calcasieu Parish, flowed an initial gage of 208.6 bbl. of 37.5°-gravity oil per day through an 8/64-in. choke. Flowing pressure was 1,650 psi., and gas ratio 655. No water in the flow. Production is from discovery sands with perforations at 10,356-366 ft. Total depth is 10,600 ft. Sohio's 2-B Farmers Land & Canal Co., fourth oil well in the area, is now being tested. Total depth is 10,488 ft., with 5½-in. casing cemented to 10,479 ft., and perforations at 10,352-362 ft. for completion.

California Co. 9 E. P. Brady et al, Unit 1, 2-16s-23e, wildcat 6,200 ft. south of Barataria field production in Jefferson Parish, is making a test for production through perforations at 11,888-892 ft. Total depth is 12,307 ft.

Thirteen new locations were reported this week with three being wildcats, two in St. Martin and one in Beauregard Parish. One wildcat was completed as dry in West Baton Rouge Parish. Five completions were producers in proven areas, one each in Delta Farms field, Lafourche Parish; Big Island field, Rapides Parish; Paradis field, St. Charles Parish, and Jeanerette and Charenton fields in St. Mary Parish.

SOUTH LOUISIANA WILDCAT FAILURE

West Baton Rouge Parish: Sohio Pet. Co. 1 Southern Land Products Co., Stumpy Bayou area, 3-7s-11e, 4 mi. N of Morley field production, dry, TD 9,162 ft

ROCKY MOUNTAIN

Big Producer Completed In Weston County Pool

DENVER.—Mush Creek pool, in Weston County, Wyoming, came in for renewed attention with the completion of Morton Drilling Co. 1 Sedgwick, C NE NE 17-44n-63w, for an estimated 400 to 500 bbl. per day of 42.2°-gravity oil at a total depth of 4,160 ft. It had the top of the Newcastle sand at 4,155 ft., and the 5½-in. was cemented at 4,153 ft. The hole filled with oil in 20 minutes after the plug was drilled, and began flowing by heads. It made 200 bbl. natural the first 12 hours and then was pinched to 225 bbl. per day. No water was encountered. The ground elevation is 4,006 ft. The well is 1½ miles west of the nearest producer and indicates that the wells on the west side toward the basin are structurally deeper and the oil is 1 to 3 degrees higher in gravity.

Another producer was completed on the east side of the pool, 3 miles from the Sedgwick well, in Platte Valley Oil & Gas Co. 2 Government, SE SW SE 11-44n-63w, completed at 3,828 ft. flowing 75 bbl. per day through a 1/16-in. choke. It had the top of the sand at 3,820 ft. Oil from the field is purchased by Carter Oil Co. and Gray Refineries, Inc., and trucked to their plants at Newcastle. Carter has a posted price of $2.10 per barrel. There are no pipe-line facilities, but applications for permits by three companies are pending. So far drilling has been confined to small independent companies.

Record depth in Utah.—Pacific Western Oil Corp. 1 Unit, C SE NE 24-14s-7e, a wildcat, Gordon Creek district, Carbon County, Utah, now has the record depth for that state and is drilling at 11,141 ft. in the Kaibab lime of Permian age. The lime overlies the Coconino sandstone, the objective. It has some small shows of gas in the lime.

Church Buttes.—Mountain Fuel Supply Co. 2 Unit, NE NE NE 22-17n-112w, Church Buttes structure, Uinta-Sweetwater counties, Wyoming, is preparing to test at 12,692 ft. A 5½-in. liner was run 12,398-12,585 ft., and tubing is being run. It is 4¾ miles northeast of the discovery. Unofficial reports describe it as a bigger gas well than 1 Unit. The 3 Unit, NE SW NE 12-16n-113w, 1½ miles west of discovery, set whipstock at 12,960 ft., and is running electric survey at 12,063 ft.

Northwest Elk Basin.—Sinclair-Wyoming Oil Co. 1 Wilkins, NW SW NW 28-9s-23e, Northwest Elk Basin, Carbon County, Wyoming, is bottomed at 6,975 ft., 700 ft. in the Madison lime, and is running 7-in. It is a discovery in several horizons. Top of Madison was 6,225 ft. Last drill-stem test reported was at 6,549-94 ft., open 45 minutes, recovered 2,300 ft. of clean oil, 250 ft. of oil-cut mud, and gas at the rate of 20,000,000 cu. ft. per day.

Cut Bank lime well.—Texas Co. 1 Doorenbos, C NE SE 25-36n-6w, a Madison lime test west of the producing wells, is testing at 3,234 ft., total depth. It had the Madison at 3,150 ft., and a show of oil and water at 3,234 ft. It tested 6.7 bbl. in 8 hours, 35 per cent oil. It was then acidized with 500 gal.

Wildcats spud.—British-American Oil Producing Co. 1 Cronican-Federal, NE NE SW 23-30n-16w, Chimney Rock district, 7 miles northeast of Hogback field, San Juan County, New Mexico, has spudded. It will be a "tight" hole. Southern Union Production Co. 1 Redd, C SE NE 23-34s-25e, Boulder Knoll District, San Juan County, Utah, an 8,000-ft. test, set 16-in. at 465 ft., and has lost circulation at 1,440 ft.

New operations.—Twenty-five new operations were reported, of which 2 were in Colorado, 11 in Wyoming, 10 in Montana, and 2 in northwest New Mexico. These include two wildcats in Colorado, two in Wyoming, three in Montana, and one in northwest New Mexico.

WILDCAT FAILURES IN COLORADO

Ridgway, Ouray County: Hawthorne Drilling Co. 1 Campbell, NW SE SW 25-46n-8w, TD 797 ft., completed as water well in Dakota.

Alamo-St. Mary's, Huerfano County: S. W. Pressey 1-X Pressey, CWL NE NW 3-27s-67w, TD 3,217 ft., plugged and abd. 800 ft. water in Dakota at 3,215 ft., Greenhorn 3,021, Graneros 3,046 ft.

Rangely, Rio Blanco County: Continental Oil Co. 1 Hall, C SE SE 5-2n-103w. TD 7,486 ft., plugged and abd. Dakota 4,803, Morrison 4,870, Entrada 5,695, Shinarump 6,658, Weber 7,453, Ele. 6,060 ft.

Santa Clara, Huerfano County: Rainbow Drilling Co. 1 Saliba, CEL SE SE 11-28s-65w. TD 225 ft., completed as water well in Dakota, Greenhorn 132 ft.

WILDCAT FAILURE IN MONTANA

Bowdoin, Phillips County: Texas Co. 2-344 Bowdoin Unit, C NW NE 34-32n-34e, TD 4,751 ft., plugged and abd. Ellis 2,598, Big Snowy 3,045, Kibby 3,145, Madison 3,215, Three Forks 4,250 ft, Ele. 2,251 gr. Loc. 14 miles east and 3 miles south No. 1 abd. at 5,852 ft. in Cambrian.

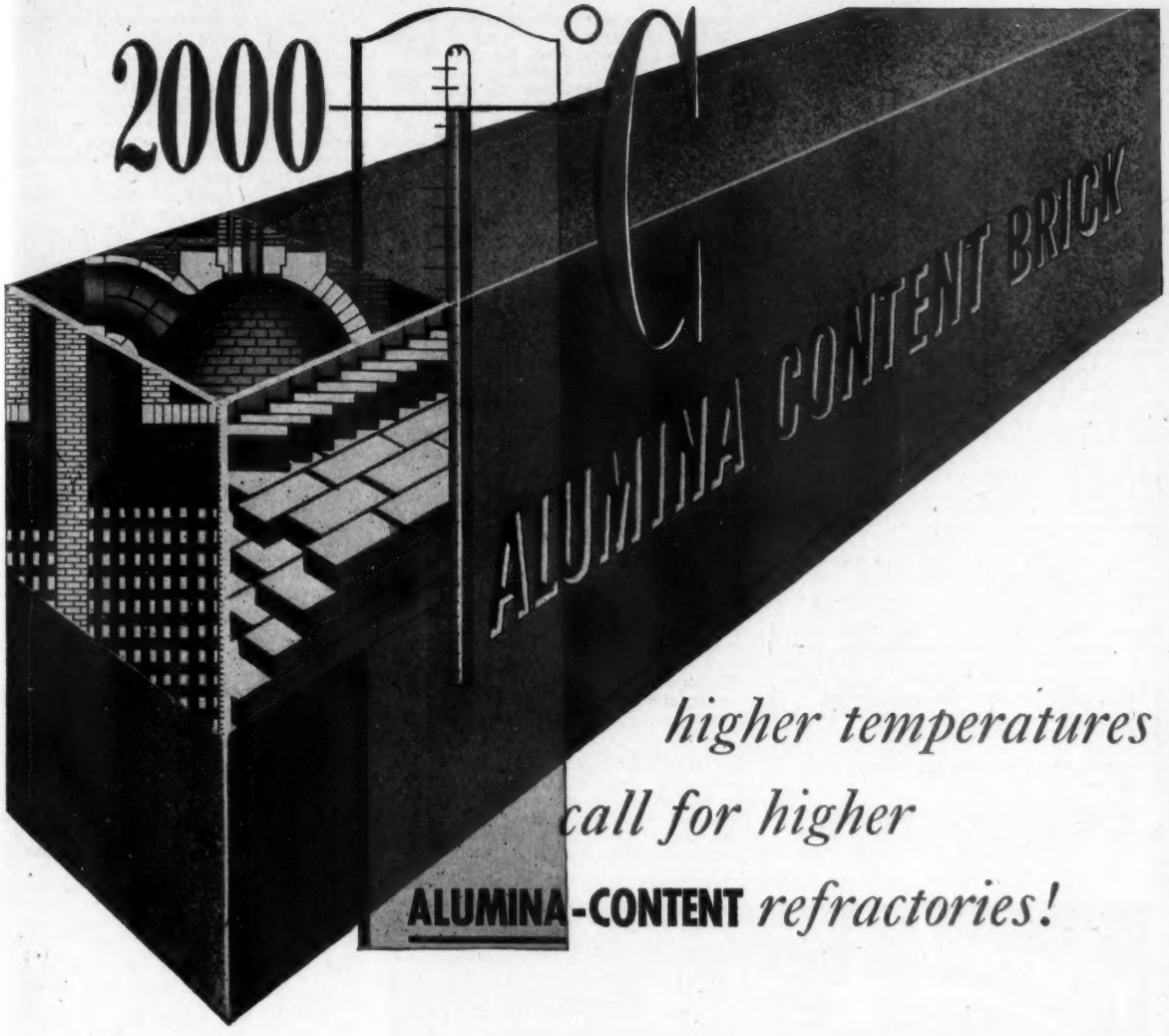
SUCCESSFUL WILDCAT COMPLETIONS IN MONTANA

Keith Block, Liberty County: Texas Co. 1 Sorrell, C NE NW 29-36n-6e, TD 5,015 ft., plugged back to 2,880 ft. and completed for 707,000 cu. ft. of gas per day. Kootenai, 2,260, Ellis 2,813, Madison 2,899, Devonian 3,775, Jefferson 3,955 ft. Ele. 3,745 RT.

Kevin-Sunburst, Toole County: Big West Oil Co. 1 Klein, CNL S½ NW 5-35n-4w. TD 2,103 ft., 2,500,000 cu. ft. of gas. Sunburst 2,005-55, Cut Bank 2,055-88, Ellis 2,088 ft.

WILDCAT FAILURE IN UTAH

Clay Basin, Daggett County: Mountain Fuel Supply Co. 6-W Murphy, NW SE NW 22-3n-24e. TD 9,355 ft., Weber reported at 9,050 ft., plugged back and completed in Dakota through perf. at 5,640-5,720 ft. for 5,210,000 ft., tops not officially released.



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MISSISSIPPI

Fishing Job Abandoned In Yazoo County Well

JACKSON.—R. T. McDermott's 1 Pauline Gaddis, Lower Cretaceous test 2 miles northeast of Bentonia, in 32-10n-1w, Yazoo County, gave up the fish job on stuck drill pipe, plugged back to 6,011 ft. to set whipstock for sidetracking. Corrected total depth was 6,221 ft. Top on the Eutaw was logged at 6,148 ft.

Amerada Petroleum Corp. 1 State, NW NE 16-18n-2e, Warren County wildcat, was said to be running low on its 1 Dabney-Bonelli test, located 1½ miles to the northwest. The 1 State was last reported drilling below 3,250 ft. in sandy shale, after coring top on the Wilcox at 3,020 ft.

In Rankin County, 3 miles south of Star, R. B. Lack and W. G. Nelson Exploration Co. 1 Ridgeway was drilling below 9,012 ft. in sand and shale. Tentative top on the Tuscaloosa was reported at 7,870 ft., on an elevation of 446 ft. Continental Oil Co. 1 H. R. Bryant, 9-5n-4w, Hinds County, was drilling at 3,205 ft. in sand and shale.

In Brookhaven field, California Co. 1 Smith, NW NW 33-8n-7e, abandoned as a failure in 1944 at total depth of 7,442 ft., in the Midway, has been drilled to new total depth of 10,453 ft. Reports are that it has 40 ft. of saturated oil sand.

In Jones County, Gulf Refining Co. continued coring at its 1 L. L. Majors. At 12,766-807 ft., cores had an odor and heavy black oil stain in the hard, dense, sandy limestone which was interbedded with the anhydrite. Cores at 12,807-828 ft. were mainly shale, with no anhydrite.

MISSISSIPPI WILDCAT FAILURE

Rankin County: R. B. Lack and W. G. Nelson Exploration Co. 1 L. E. Ridgway, SE SE 35-3n-2e, dry, TD 9,178 ft., Wilcox 2,600 ft., Midway 5,512 ft., chalk 6,248 ft., Eutaw 7,390 ft., Tuscaloosa 7,870 ft., Marine Tuscaloosa 8,645-8,756 ft., Massive sand 8,949 ft., Comanche 9,107 ft., elevation 446 ft.

FLORIDA WILDCAT FAILURES

Holmes County: S. W. Breeding 1 N. E. Coats, SE NW 25-7n-15w, dry, TD 4,107 ft., no shows or tops reported.

Putnam County: Sun Oil Co. and Seaboard Oil Co. 1-A Q. I. Roberts, NW NW 19-9s-25e, dry, TD 3,328 ft., no shows or tops reported.

PERMIAN BASIN

Hopes Dimmed for Big Ellenburger Producer

MIDLAND.—Water table in Sinclair Prairie Oil Co. and Atlantic Refining Co. 1-66 University, Ellenburger prospect in northeastern Crockett County, dimmed the hopes of a large producer. Earlier in the week, the well had flowed as high as 80 bbl. of oil an hour, with no water, from 7,512-62 ft. When first opened, at that depth, gas came to the surface in 50 seconds and was estimated at 2,000,000 cu. ft. a day. Mud flowed at the surface in 7 minutes and oil started flowing in 8 minutes. It was allowed to clean itself into pits for 2 hours, then turned into tanks. Oil was 44.8°-gravity. A second test at 7,562-7,068 ft. flowed at the rate of 12½ bbl. of oil an hour, with 580,000 cu. ft. of gas.

On a test from 7,984-7,608 ft., total depth, there was a slight blow of air in 6 minutes. The tool was open 1 hour and recovery was 35 ft. of drilling mud, having no oil, gas or water. Operators then drilled ahead to 7,680 ft., where a 1-hour drillstem test was made. Gas came to the surface in 40 minutes, and recovery was 450 ft. of drilling mud, and 3,450 ft. of salt and sulfur water. Electric survey was to be run to determine completion methods. This well topped the Ellenburger at 7,396 ft., with gas-distillate indicated at 7,512 ft., and oil pay to 7,640 ft. Location is in Section 30, Block 46, University Lands, 8 miles northeast of Todd Deep field.

Also in northeastern Crockett County, and some 12 miles east and south of the 1-66 University, Humble Oil & Refining Co. 1 Elizabeth Mitcham, Section 12, Block AB, D&SE Survey, was in the Ellenburger at 7,995 ft. It was deepened to 8,075 ft., where a drill-stem test was made, with packer at 8,006 ft. Gas came to the surface in 2½ minutes, estimated at 496,000 cu. ft. a day, and rising to nearly double that amount in 1½ hours. The tool was open 2 hours, giving a recovery of 480 ft. of heavily gas and distillate-cut mud, plus 90 ft. of salt water. Operators planned to recheck the formation to determine the source of water.

Possible Clear Fork production was indicated at The Texas Co. 31 W. E. Connell, Ellenburger failure, 3 miles west of Jordan field in northern Crane County. After washing with 500 gal. of mud acid, through perforations at 6,920-55 ft., the well swabbed and flowed at the rate of 1 bbl. of oil an hour. A second treatment of regular acid stepped the oil up to approximately 9 bbl. of oil, cutting 7 per cent sediment, in 1 hour and 50 minutes. After further tests, operators were to plug back and test around 4,700 ft., where shows of oil were logged in drilling.

Shell Oil Co., Inc. 1-A Cochran, Section 34, Block 46, T&P Survey, a semiwildcat 1 mile west of the north end of TXL field, Ector County, was completed for 39 bbl. of oil a day from the Devonian. Total depth was 8,150 ft., with top of pay at 7,955 ft.

WEST TEXAS WILDCAT FAILURES

Andrews County: Edmiston Drilling Co. and Joe Canon 1 University, Sec. 21, Blk. 1, University Lands, 8½ mi. SE Andrews, dry, TD 5,115 ft., anhydrite 1,840 ft., Yates 3,100 ft., Grayburg 4,540 ft., San Andres porosity 4,850 ft., elevation 3,131 ft., no shows.

Crane County: The Texas Co. 1 A. B. Connell, Sec. 9, Blk. B-22, PSL, 3 mi. W Jordan field, dry, TD 7,637 ft., Yates 2,260 ft., San Andres 3,610 ft., Glorietta 4,590 ft., Woodford 7,620 ft., elevation 2,829 ft., shows of oil and gas in DST 4,732-4,840 ft.

Dawson County: R. A. Albaugh 1 J. Y. Graves, Sec. 48, Blk. 34, T&P Sur., SE cor. of county, dry, TD 5,703 ft., Yates 2,020 ft., Grayburg 3,240 ft., San Andres 3,750 ft., Glorietta 4,340 ft., Clear Fork 4,560 ft., elevation 2,821 ft., no shows.

Gaines County: Honolulu Oil Corp. 1 Kerschner, Sec. 430, Blk. G, CCSD&RGNG Sur., 13 mi. W Seminole, dry, TD 7,702 ft., anhydrite 1,920 ft., Yaes 3,020 ft., dolomite 3,190 ft., brown limestone 4,040 ft., elevation 3,489 ft., gas-cut mud on DST 4,836-80 ft.

Tom Green County: James Gouras 1 F. P. Elliott, Sec. 68, Dist. 11, SPRR Sur., 10 mi. SE San Angelo, dry, TD 2,306 ft., show oil 1,762 ft., show gas 2,020 ft., show oil 2,058-59 ft.

Winkler County: Amon G. Carter 1 S. B. Wight, Sec. 29, Blk. 40, PSL Sur., 7 mi. SW Wheeler field, dry, TD 12,409 ft., Yates 2,670 ft., Tubb 6,280 ft., base Permian 8,090 ft., Mississippian 8,940 ft., Woodford 9,550 ft., Devonian 9,990 ft., Silurian 10,260 ft., Montoya 10,780 ft., Simpson 11,150 ft., Waddel sand 11,920 ft., Ellenburger 12,265 ft., elevation 2,949 ft., DST 6,673-6,800 ft. recovered some free oil, DST 12,263-334 ft., had slight show oil and gas, PB 6,886 ft., recovered all sulfur water.

SOUTHEAST NEW MEXICO

HOBBS.—Three and one-half miles east of Jal R. Olsen et al 1 Wimberly, Ellenburger, test in the SE NE 23-25s-37e, Lea County, reported a show of gas at 2,254-64

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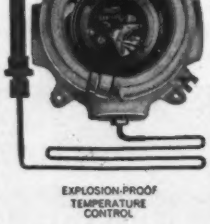

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ft., with total depth at 2,799 ft. Culbertson-Irwin, Inc. 1 Shepherd, 1-21s-32e, 5 miles west of the Lynch field, was drilling ahead below 1,500 ft. after setting surface casing. It is scheduled to test at 3,750 ft.

In Eddy County, Grayburg Oil Co. 13-B Keeley, 26-17s-29e, a 5,000-ft. test on the southwest side of the Grayburg-Jackson area, had total depth at 6,040 ft. in limestone, and plugged back to 3,533 ft., where it pumped 15 bbl. of water and 3 bbl. of oil a day.

Locations for two wildcat tests in Chaves County and one in Lea County were reported. In southeast Chaves County, E. A. Hanson 1 Aston, NW SW 15-15s-31e, is scheduled to go to 4,000 ft. Northwest of Caprock, Fred Pool 1 British-American fee, NW NE 29-11s-30e, 18 miles northwest of Caprock, will go to 3,000 ft. In Lea County, Cole-Darden Oil Co. 1 Phillips-State, SE SE 30-17s-34e, 1½ miles west of the Vacuum field, is to be a 4,700-ft. test.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

Chaves County: Richfield Oil Corp. 1 White, SE NE 6-12s-29e, 18 mi. NW Caprock, dry, TD 9,058 ft., Yates 620 ft., San Andres 1,870 ft., Glorietta 3,105 ft., Pennsylvania 6,613 ft., Mississippian 7,750 ft., Devonian 8,320 ft., Silurian 8,460 ft., Ellenburger 8,760 ft., pre-Cambrian 9,040 ft., elevation 3,710 ft., DST 2,476-2,680 ft., recovered water with trace of oil.

OKLAHOMA

Prospective Pool Opener In Garvin County

CITIES SERVICE OIL CO. and Mid-Continent Petroleum Corp. 1B Rogers, SW NE SE 25-4n-4w, Garvin County, on 80-minute drill-stem test at 7,982-8,037 ft., in Deese formation of lower Pennsylvanian, showed gas at surface in 11 minutes, fluid in 57 minutes, and flowed oil in 75 minutes. Oil was estimated at rate of 30 bbl. per hour, accompanied by gas at rate of 250,000 cu. ft. per day. Deese was topped at 7,974 ft. and hole was drilled to 8,037 ft. A successful completion in the Rogers well would be an important exploratory development as well is located 3½ miles south of production in the East Lindsay pool.

Magnolia Petroleum Co. 1 Lacy, SW NW 5-4n-3w, Garvin County, flowed 285 bbl. oil in 9 hours, through ½-in. bottom choke and then made 284 bbl. in 4 hours through ½-in. top and bottom chokes. Pipe was perforated opposite Bromide pay at 9,608-35 ft. Top of Bromide is 9,388 ft. and total depth is 10,250 ft. Pipe was set on bottom. The Lacy well gives the East Lindsay pool an east extension of 1¼ miles and gives the new pool an east-west width of 2½ miles.

Carter Oil Co. 1 Harrison, SW SW 31-5n-3w, McClain County, a northeast diagonal offset to the East Lindsay discovery well which produces from the Hunton, flowed 25 bbl. 41°-gravity oil on drill-stem test at 9,875-9,915 ft. in Bromide. Gas volume was estimated at about 3,500,00 cu. ft. per day. This is the second completion on the north side of the pool in McClain County.

Superior Oil Co. of California 1 Harris, NE NE NW 26-5n-4w, McClain County, on drill-stem test at 10,790-892 ft., flowed 200 bbl. 46.8°-gravity oil in 5½ hours through ¼-in. choke, with packer set at 10,790 ft. and casing at 10,901 ft. The test indicates a joining up of the North Lindsay and Northwest Lindsay pools.

Davon Oil Co. 1 Dye, SE SW NW 15-14n-5e, Lincoln County, flowed 32 bbl. oil per hour on 2-hour test through 2½-in. tubing from Prue sand topped at 3,370 ft. where pipe was set. Total depth is 3,414 ft. The well is about 1 mile southwest of the Davenport pool.

Harper and Turner Oil Co. 1 Hyden, SE SE NW 10-14n-3w, Oklahoma County, flowed 240 bbl. fluid, about 11 per cent water and mud, on 24-hour test through ¼-in. choke. Production is from Second Wilcox, topped at 6,516 ft. Pipe was set on bottom at 6,561 ft. and perforated from 6,526-34 ft. This prospective pool opener is about 3 miles west of the Northeast Edmond pool.

OKLAHOMA SUCCESSFUL WILDCATS

Garvin County: Sohio Oil Co. 1 Howard, SE SE NW 17-1n-2w, flowed 696 bbl. of 40°-gravity oil per day from Bromide at 10,060-10,234 ft. through 5/16-in. choke, Pontotoc 2,550 ft., Springer 6,087 ft., Mississippian Caney 7,630 ft., Woodford 8,024 ft., Hunton 8,571 ft., Base McLish sand 10,713 ft., TD 10,818 ft. Opened Eola pool.

McClain County: Dearing, Inc. 1 Howard, NW NW 15-5n-2w, flowed 20 bbl. of 40°-gravity oil by heads per day from Deese at 7,044-88 ft.; Oread 4,550 ft., Tonkawa 4,830 ft., Misener 7,148 ft., Hunton 7,152 ft., TD 7,200 ft.

OKLAHOMA WILDCAT FAILURES

Caddo County: Grayhill Drilling Co. 2 Westelline, SW NE NE 34-6n-12w, dry, TD 4,312 ft., Woodford 1,521-61 ft., Sylvan 2,628 ft., dolomite 2,812 ft., Viola 3,155 ft., Chimney Hill-Hunton 3,605-45 ft., Hunton 4,105 ft.

Carter County: Continental Oil 1 Milroy, SE SE SW 6-3s-1w, dry, TD 7,177 ft.

Cotton County: Nixon Petroleum Co. 1 Urper, NW SW SE 9-2s-12w, dry, TD 2,577 ft., Arbuckle 2,510 ft., no shows.

Bridwell 2 Shaw, SE NW SW 15-3s-11w, dry, TD 1,691 ft.

Bridwell 1 School Land, SE NW NE 16-3s-11w, dry, TD 1,726 ft., sand 1,449-52 ft., conglomerate 1,530 ft.

Winfrey Brothers 1 Pen-Ner-Or-Ive, NW SW SE 24-3s-12w, dry, TD 1,664 ft., lime 1,414 ft., conglomerate 1,532-45 ft., no shows.

J. Ben Russell 1 Fletcher, NE NE NW 11-3s-11w, dry, TD 2,111 ft., Megargel lime 2,065 ft.

F. E. Webb 2 Wilson, NW NE SW 8-4s-11w, dry, TD 1,661 ft. in shale.

Nixon Petroleum Co. 1 Inman, NW NE NW 8-5s-12w, dry, TD 1,606 ft., no tops reported.

Garvin County: Kirkpatrick-Bales 1 Gam-

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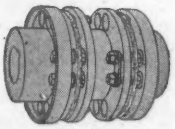
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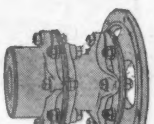
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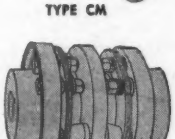
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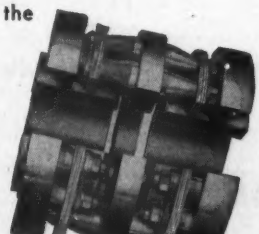
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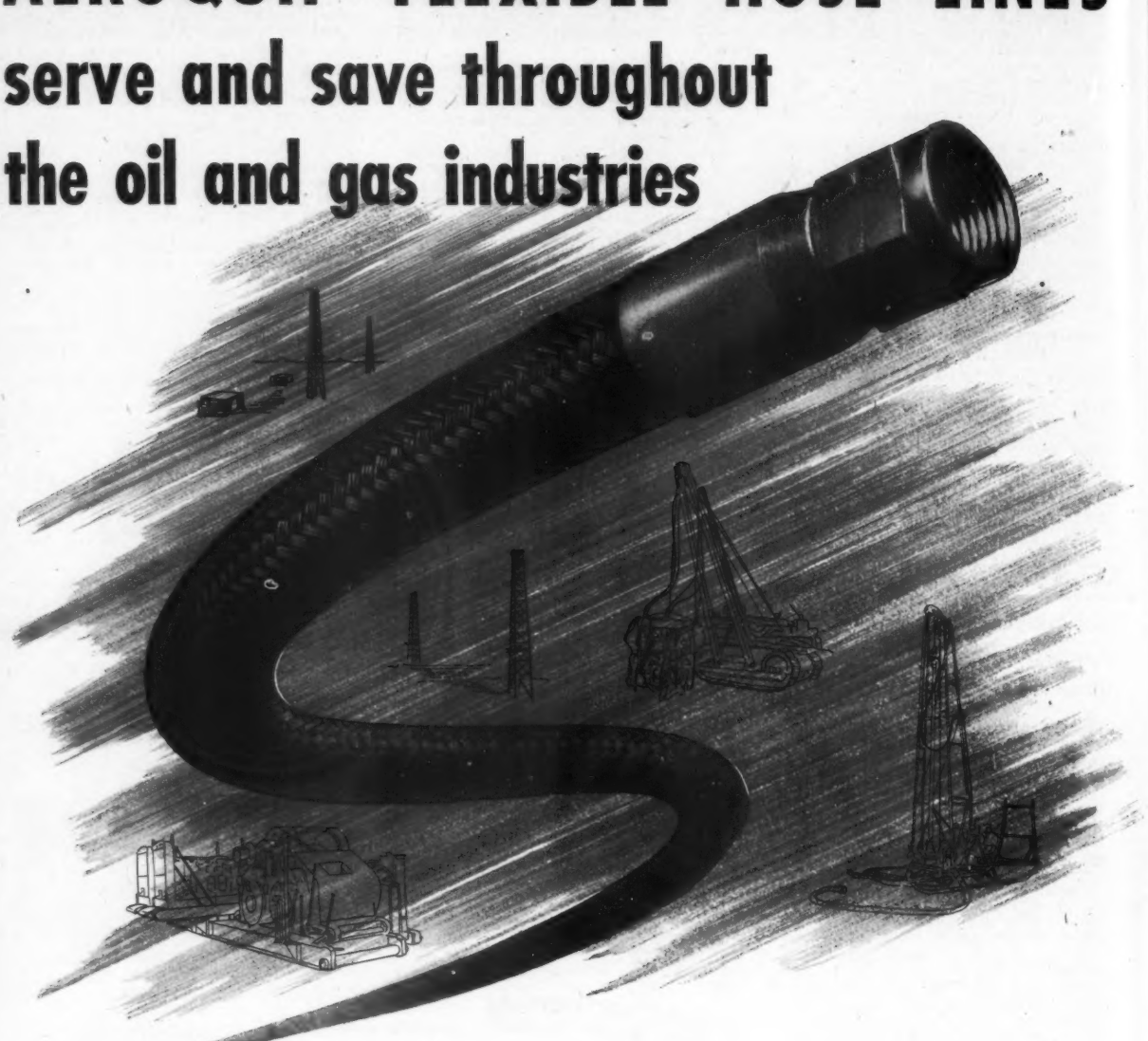

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mell, NE NW NE 18-4n-2e, dry, TD 3,980 ft., no tops reported.

Kiowa County: D. T. Potts et al 1 Bell, NW NW NE 22-6n-20w, dry, TD 686 ft., Granite wash 540-683 ft.

Hartwell 1 Fields, SE NW NE 23-7n-17w, dry, TD 1,300 ft., shaly conglomerate 969 ft.

Pontotoc County: Kenneth Nix 1 Pearly West (Wolf), SW SW NE 17-5n-7e, dry, TD 2,470 ft., sand 1,400 ft., Wapanucka 2,285 ft., Cromwell 2,420 ft.

Seminole County: Gem Oil Co. 1 Emorthal, NE NE NW 5-5n-6e, dry, TD 2,039 ft., Senora 2,025 ft.

Stephens County: Kingwood Oil Co. 1 Welles, SE SE NW 6-1s-5w, dry, TD 4,518 ft., sand 1,812-37 ft., 3,053-83 ft., 2,692-2,720 ft. and 2,820-40 ft.

KANSAS

Paradise Creek Pool Has Seventh Maximum Well

CITIES SERVICE OIL CO. 2 Hilgers, CEL SW NE 21-9s-18w, Rooks County, is the seventh maximum well completion out of a total of 10 wells in the Paradise Creek pool. All wells to date are in Section 21. In the NW NW NE Section 28, Skelly Oil Co. 1 Rempe, has set pipe on top of Arbuckle and is waiting on pump to take potential.

Mid Plains Oil Corp. et al 1 Reidy, NE NW NW 15-32s-7e, Cowley County, opens a new pool with a small well in the Bartlesville. Hole was drilled to 2,945 ft., 29 ft. into the Mississippi lime and plugged back to 2,836 ft. Pipe was set on top of Bartlesville at 2,817 ft. The well was shot with 20 qt. at 2,821-30 ft. Pump potential is 25 bbl. oil and 50 bbl. water. The test is between the Countryman and Reidy pools, about 3 miles northeast of the former and 6 miles southwest of the latter.

Derby Oil Co. 1 Simmons, SE SW SW 3-18s-11w, Barton County, has pipe set 1 ft. in Arbuckle which was topped at 3,328 ft. Total depth is 3,332 ft. The well is about 1½ miles north of the Ames pool.

Phil-Han Co. 1 Reidel, SE SE SW 10-17s-14w, Barton County, has pipe set at 3,350 ft. to test Lansing shows, after finding Arbuckle dry at total depth of 3,495 ft. Top of Lansing is 3,178 ft.

KANSAS SUCCESSFUL WILDCATS

Ellis County: Keyes Drilling 1 Marshall, NW NW NW 25-11s-18w, produced 3,000 bbl. of oil per day from Arbuckle at 3,622-24 ft.; anhydrite 1,320 ft., Heebner 3,269 ft., Lansing-Kansas City 3,313 ft., conglomerate 3,560 ft., Simpson shale 3,572 ft., Simpson dolomite 3,599 ft., Simpson sand 3,616 ft., Arbuckle 3,618 ft., TD 3,624 ft.

Marion County: J. Liker et al 1 Henke, SW SE SW 33-18s-4e, produced 25-30 bbl. of oil per day from Mississippi chat at 2,384-2,442 ft.; Kansas City 1,836 ft., TD 2,446 ft.

Stafford County: Brunson et al 1 Howard, NW NW SE 15-22s-13w, pumped 307 bbl. of 30°-gravity oil per day from Lansing-Kansas City at 3,505-12 ft.; conglomerate 3,670 ft., Heebner 3,237 ft., brown lime 3,363 ft., Viola 3,682 ft., Simpson shale 3,728 ft., Arbuckle 3,787 ft., TD 3,793 ft.

Woodson County: King et al 1 Tichnor, SE SE SE 24-23s-15e, gaged 1,000,000 cu. ft. gas from Mississippi lime at 1,457-88 ft., TD 1,488 ft.

KANSAS WILDCAT FAILURES

Butler County: El Dorado and Rex & Morris 1 Baucher, SW SW NE 27-26s-4e, dry, TD 2,790 ft., Kansas City 2,150 ft., conglomerate 2,667 ft., Mississippi lime 2,720 ft.

Saco et al 1 Covert, NE SW NW 10-28s-5e, dry, TD 3,183 ft., Lansing-Kansas City 1,790 ft., Kansas City 2,125 ft., Mississippian 2,729 ft., Basal Mississippi lime 2,055 ft., Simpson 3,141 ft., Arbuckle 3,177 ft.

Cowley County: McNeish & Gralapp 1 Stauffer, NW NE SE 26-33s-6e, dry, TD 2,907 ft., Mississippi lime 2,900 ft.

Graham County: Wilcox and D & R 1 Wagner, SW SW SE 16-6s-22w, dry, TD 3,950 ft., Topeka 3,367 ft., Heebner 3,564 ft., Lansing-Kansas City 3,591 ft., Basal Kansas City 3,798 ft., Arbuckle 3,902 ft.

McPherson County: Mallard Drilling Co. 2 Robinson, NW SW SE 32-17s-1w, dry, TD 2,732 ft., no tops reported.

Phillips County: Tom Palmer 1 Fox, NE NE NE 15-4s-20w, dry, TD 3,645 ft., anhydrite 1,667 ft., Lansing-Kansas City 3,266 ft., conglomerate 3,602 ft., Arbuckle 3,616 ft.

Rooks County: B & R Drilling 1 Henrie, NE NE SE 2-10s-19w, dry, TD 3,764 ft., anhydrite 1,556 ft., Topeka 3,119 ft., Heebner 3,355 ft., Lansing-Kansas City 3,394 ft., Basal Kansas City 3,615 ft., conglomerate 3,649 ft., Simpson 3,712 ft., Arbuckle 3,732 ft.

LA.-ARK.

Elm Grove Shallow Well Shut Down for Orders

SHREVEPORT.—Status of M. A. Halsey et al 1-B Skidmore, prospective shallow producer 2½ miles northeast of Elm Grove field in Bossier Parish, was undetermined. The well was plugged back to 2,626 ft., from total depth of 5,837 ft., and perforations at 2,613-18 ft. produced wash water with a slight show of oil, in bailing operations. Shut in 12 hours, fluid rose 300 ft. in the hole, of which one-third was oil. Additional perforations at 2,618-20 ft. resulted in bailing an unestimated amount of oil, salt water and sand. It was shut down for orders. Top of the Tuscaloosa was 2,598 ft., and lower Cretaceous at 2,654 ft. Production in Elm Grove field ranges from sands of the upper Cretaceous to the Wilcox, around 4,500 ft.

In Bienville Parish, Union Producing Co. and Pure Oil Co. 1 Frazier, 14-14n-6w, was drilling below 5,958 ft. in limestone and anhydrite. Top on the Massive anhydrite was estimated at 5,875 ft. Angle & Crain's 1 E. M. Clark, 2-20n-7e, Morehouse Parish, was coring below 3,930 ft. in the Cotton Valley, with no shows reported. Location is ½ mile northeast of a 7,700-ft. dry hole, which found shows of oil. In Red River Parish, Union Producing Co. 1 Campbell, 20-12n-10w, was drilling below 5,689 ft. in the lower Glen Rose. A drill-stem test at 5,016-39 ft., open 20 minutes, recovered only 50 ft. of mud and 150 ft. of salt water, with no shows. In DeSoto Parish, E. C. Laster et al had total depth at 5,389 ft. in the lower Glen Rose at the 1 A. D. Witherspoon, 3-14n-14w. This was an old test abandoned at 4,201 ft. in the Paluxy. Plans were to deepen to around 5,700 ft. A drill-stem test at 5,229-5,389 ft., open 44 minutes, recovered 390 ft. of gas-cut mud, and 210 ft. of mud cut with gas and salt water.

In Ouachita County, Arkansas, Ormond Corp.'s 1 L. E. Wesson was completed for a pumping potential of 55 bbl. of oil in 9 hours from perforations at 2,379-85 ft. in Tokio sand. Total depth was 2,757 ft., in the lower Glen Rose. Location is 1 mile northwest of Glen Rose production in Wesson field.

In Lafayette County, McAlester Fuel Co. 1-A McDonald, 23-17s-24w, was drilling below 8,259 ft. in the Cotton Valley. N. H. Wheless 1 Knighton, 8-15s-24w, was below 5,569 ft. in Cotton Valley. In Little River County, Frank Frankel 1 N. Locke, 19-13s-30w, was drilling below 3,810 ft. in the Travis Peak formation. It was originally scheduled to drill to 3,500 ft. Southwest of the Fouke field, Miller County, Big Chief

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Drilling Co. 1 A. N. Froid, 29-17s-27w, was waiting on cement at 1,833 ft. in the Arkadelphia.

NORTH LOUISIANA WILDCAT FAILURES

Morehouse Parish: Union Oil Co. of Calif. 1 B. W. Pipes, NW NW NE 19-19n-6e, dry, TD 2,977 ft., no tops reported.

Richland Parish: L. W. Dennis 1 J. L. Tatum, SE NW SW 18-17n-9e, dry, TD 4,417 ft., Wilcox 1,671 ft., Midway 2,550 ft., chalk 3,030 ft., gas rock 3,038 ft., upper Glen Rose 3,041 ft., James 4,250-4,330 ft., elevation 85 ft.

G. B. Franklin 1 J. E. Cochran, SW NW NW 10-17n-8e, dry, TD 3,007 ft.

Union Parish: F. B. King 1 E. L. Ramsey, NW SE SE 3-21n-1w, dry, TD 3,252 ft., Arkadelphia 2,016 ft., Nacatoch 2,193 ft., Saratoga 2,261 ft., elevation 199 ft.

Rogers Lacy et al 1 J. B. Baughman, NE SW NE 36-22n-1w, TD 2,561 ft.

ARKANSAS WILDCAT FAILURE

Little River County: Ben Owens & Co. 1 Wade Atkinson, SW SE 10-12s-32w, dry, TD 1,206 ft., no tops reported.

ILLINOIS

Prospective Pool Opener In Aux Vases West of Dundas

MATTOON.—Indiana Farm Bureau et al 1 Fuller, SW SE NW 21-5s-9e, White County, recovered 2,450 ft. oil and 150 ft. mud-cut oil and water on drill-stem test in Aux Vases at 3,193-3,201 ft. The test is located about 2 miles west of Dundas Consolidated pool.

Gilliam Drilling Co. et al 1 Berta Ebe, NE NE NW 14-2n-4e, Marion County, is pumping 22 bbl. oil per hour from St. Louis pay at 2,874-84 ft., after acid treatment with 1,000 gal. Total depth is 2,884 ft. The well is about 12 miles east of the Salem pool.

ILLINOIS SUCCESSFUL WILDCATS

Gallatin County: C. E. Skiles 1 Stinson, NW SW NE 9-9s-9e, old TD 2,014 ft., PB 1,451 ft., pay 1,429-49 ft., Pennsylvanian sand, IP 17 bbl.

Wayne County: Nation Oil Co. 1 Cisne, NW NW NW 10-1s-7e, IP 40 bbl. in Aux Vases 3,098-3,110 ft., TD 3,117 ft., shot 90 qt., 5½-in. at 3,085 ft.

ILLINOIS WILDCAT FAILURES

Clay County: Perry Fulk 1 Martin, NW NE SW 14-3n-5e, dry at 3,038 ft., no log.

Edwards County: Continental Oil Co. et al 1 Mode, SE SE NE 32-2s-14w, dry at 3,143 ft., Glen Dean 2,452 ft., Barlow 2,688 ft., Rosiclare 3,057 ft., McClosky 3,088 ft.

Effingham County: National Associated Oil Co. 2 Kohnert, CN½ S½ 18-7n-6e, dry at 2,552 ft., Glen Dean 1,972 ft., Aux Vases 2,344 ft., Ste. Genevieve 2,405 ft., McClosky 2,438 ft., St. Louis 2,546 ft.

Joe Dunbar 1 Diebel, NW SW SW 13-7n-7e, dry at 2,965 ft., Glen Dean 2,350 ft., Cypress 2,578 ft., Ste. Genevieve 2,792 ft., McClosky 2,828 ft., St. Louis 2,933 ft.

Lawrence County: P. Gerasimos 1 Williams, SE NE SW 9-3n-11w, dry at 3,262 ft., Ste. Genevieve 1,779 ft., Lower O'Hara 1,832 ft.

Marion County: Nash Redwine 1 Conant, SW SW SE 24-4n-2e, dry at 1,779 ft., Glen Dean 1,595 ft., Golconda 1,666 ft., Barlow 1,745 ft., Cypress 1,773 ft.

Richland County: J. L. Black 1 Ash, NE SE SE 18-2n-9e, dry at 3,070 ft., no log.

Wabash County: Joe Reznik 1 Summer, SW NE NW 4-1s-13w, dry at 2,750 ft. Glen Dean 2,104 ft., Aux Vases 2,622 ft., Ste. Genevieve 2,650 ft., McClosky 2,710 ft.

OHIO, KENTUCKY

Big Gas Flow Found In Monroe County Well

COLUMBUS.—A. E. Robinson et al struck a big flow of gas in the Injun sand while drilling the 3 Henry G. Frank, Section 7, Franklin Township, Monroe County. The sand was topped at 1,410 ft. and gaged 1,910,000 cu. ft. at 1,520-25 ft. Pools in this area are very small and this well is probably on a small local structure.

In Woodsfield pool, Gillespie, Walters et al completed a 492,000-cu. ft. well on John Craig, Section 22, Center Township, Monroe County. Berea sand at 2,050-64 ft. paid all the way through.

A small gas well and a small oil well now mark the northeast limits of La Grange pool. Ohio Fuel 1 C. B. Dawson, Lot 68, La Grange Township, Lorain County, found the Clinton sand at 2,457-61 ft. with an open flow of 409,000 cu. ft. natural. A third of a mile northeast, Hanley & Bird had previously completed a 10-bbl. producer on the Hasting M. Jones, Lot 68.

Five wells are now drilling or are ready to start in Deerfield Township, Morgan County. Underwood et al have a wildcat location in Section 14 on Lawrence Wiseman; John Morrow will drill a semiwildcat location on Bruce Ford, Section 19; Linkhorn et al are drilling the 1 E. G. Patterson in Section 21, and National Gas & Oil has started east and south offsets to its Bankes 2 in Section 20.

New locations are up again this week to 29. Perry and Washington counties reported four each, and Ashland, Muskingum, and Morgan counties had three each. The balance were scattered over nine counties.

(Continued on page 135)

ROLLER OIL SAVERS

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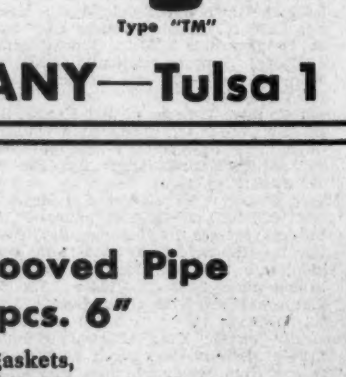

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Brooklyn 32, N. Y.
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Among the

Drilling Contractors

Special Train Offered For A. A. O. D. C. Meeting

Texas & Pacific Railway Co. has offered to run a special train from Fort Worth and Dallas to Long Beach, via El Paso, to accommodate drilling contractors, allied industry men, and their families who desire to attend the annual meeting of the American Association of Oilwell Drilling Contractors in Long Beach, October 13-15.

It is necessary to guarantee 120 first-class one-way tickets to obtain a special train. All persons interested should notify the A.A.O.D.C. Dallas office at once, stating the number of tickets desired.

Meanwhile, California contractors and supply companies are pushing preparations for the meeting and an outstanding program is expected. Plans are being made for a banquet in the convention hall of the Long Beach Municipal Auditorium for 1,200 people. To entertain the ladies, a "brunch" at one of the local country clubs with an "Out of This World" fashion show is in the state of preparation.

Announcement has been made of the committees which will handle the meeting. K. L. Kellogg of K. L. Kellogg & Sons is chairman of the central committee which has the following members: D. H. Graham, Dunlap & Graham; E. C. Brown, Brown Drilling Co.; Ralph Marshall, Drilling & Exploration Co.; and Ed Simonis, Santa Maria Drilling Co.

Appointed as chairmen of other committees were: George McCarthy, Shamrock Drilling Co., entertainment; A. S. Hayes, Hayes & Sprague Drilling Co., program; G. L. Fowler, Fowler Drilling Co., transportation; J. E. Pettijohn, banquet and food; and Gene Reid, Gene Reid Drilling Co., registration. Marshall will be in charge of finance, and Graham will handle publicity and housing.

Penrod Drilling Co., Dallas, is drilling a Georgia wildcat, the Hunt Oil Co. 3 Superior Pine Products, Land Lot 532, District 13, Echols County.

Portable Drilling Co., Tulsa, is planning to drill 1 A. M. Ross, SW SW NW 32-17n-3e, a 4,250-ft. test, Lincoln County, Oklahoma.

Ideal Drilling Co., Olney, Ill., has contract for Ashland Oil & Refining Co. 2 Jane Elkins, NE 12-1s-12w, a 2,400-ft. test, Knox County, Indiana.

Jackson Drilling Co., Duncan, will drill two shallow Oklahoma tests

This shot taken on the Shell L-6, TXL field, Ector County, Texas, shows W. R. Keller (left), insurance inspector, and a Thompson-Carr Drilling Co. crew. The crew includes B. O. Moore; A. L. Roff; A. A. Ferguson, driller; Frank Robison, and L. M. Brown

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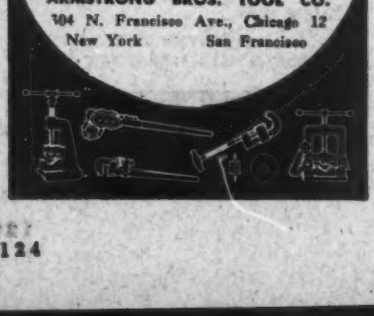

soon; the 2 Burton, NW SW SE 31-1s-2w, a 2,700-ft. test, Carter County, and 3 Schick, SW SE NE 27-1s-8w, a 2,500-ft. test, Stephens County.

Jackson Drilling Co., Duncan, is starting a wildcat, its 2 Peck "A," SW SW SW 32-2S-6w, Stephens County, Oklahoma.

Commonwealth Drilling Co., Calgary, Alta., is completing Highwood-Sarcee Oil Co. 1 Highwood-Dina. The well, testing a 20,000-acre block in eastern Alberta, shows as a good prospect to extend production south of present proven area in Lloydminster field.

Williams Drilling Co. has opened offices at Olney, Ill.

Texana Drilling Co., Kilgore,, is the contractor for a 4,000-ft. test, L. E. Winslow 2 Laura Bigger et al, C. C. Tutt Survey, 3 miles southwest of Shelbyville, Shelby County, Texas.

Guy Mabee Drilling Co., Midland, has a 9,500-ft. contract to drill C. W. Chancellor 1 Thornton Davis, C NW SE, Section 105, Block 8, H&GN Survey, 7 miles south of Grand Falls, Pecos County, West Texas. Location is on a 1,120-acre farmout from Shell Oil Co., Inc.

John W. Hoosier has received a contract for the Woodbine, the A. F. Richardson 1 J. R. Sessions, Sidney A. Sweet Survey, 5 miles east of Wortham, Freestone County, East Texas. Location is on a 2,600-acre block.

C. E. O'Neal, Evansville, has started Ashland Oil & Refining Co. 1 Schultz, NW SE NW 28-6s-14w, Posey County, Indiana.

Tanner Drilling Co., Shreveport, is back in business after a several-month shutdown due to the illness of J. W. Tanner, owner and manager.

Broadlee Drilling Co. has a 5,000-ft. contract for Tom Payne and S. W. Breeding 1 N. E. Coats, SE NE 25-7n-15w, Miller Crossroads Prospect, 15 miles southeast of Geneva, Ala., Holmes County, Florida. Broadlee also has a contract for a wildcat in Okaloosa County, Florida, the R. T. Adams 1 B. H. Hart, NE NE 5-4n-22w. 12 miles northeast of Crestview.

O'Rourke-Baker Drilling Co., Tulsa, has moved its offices from 910 South Boston to 429 National Bank of Tulsa Building.

Mayfield Drilling Co., Shreveport, is drilling a wildcat in Bossier Parish, North Louisiana, its 1 Scott-Stewart 24-19n-11w, Bellevue field.

W. T. Nelson Exploration Co. will drill A. R. Temple 1 W. T. Smith Lumber Co., NE NE 26-8n-16e, 7 miles south of LaVern, Crenshaw County, Alabama. Location is on a farmout from Atlantic Refining Co. and contract is for 8,000 ft. to test the Eutaw and the Tuscaloosa.

M. J. Delaney Drilling Co., Dallas, has started two wells for Hiawatha Oil & Gas Co. On the Abbie Whitton tract, one location north of San Augustine County discovery, derrick was up and the crew was ready to drill ahead. The second test is the 1 M. E. Davis, a Travis Peak test in the Cheverel Survey, east of Red Hill Lake, Sabine County, East Texas.

Gilliam Drilling Co., Evansville, has received permit to drill its 1 Berta Ebe, 330 ft. from south and west lines, NE NW 14-2n-4e, Marion County, Illinois.

Pike Drilling Co., Los Angeles, is drilling ahead below 10,570 ft. at Basin Oil Co. 1 City of Inglewood, 28-2s-14w, a prospective wildcat discovery in the Inglewood area of Los Angeles County, California. On a test made during the past week, this well showed oil and gas with no water. A mile northwest of the Basin venture, the Pike company is drilling ahead below 9,100 ft. at the Macco

Standco
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Nothing novel—no bunk, but it gets the job done without scoring brake rims. See pages 3608-3613, Composite Catalog.

Standco Brake Lining Co.
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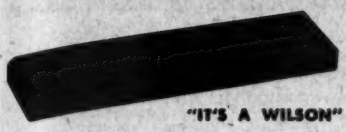

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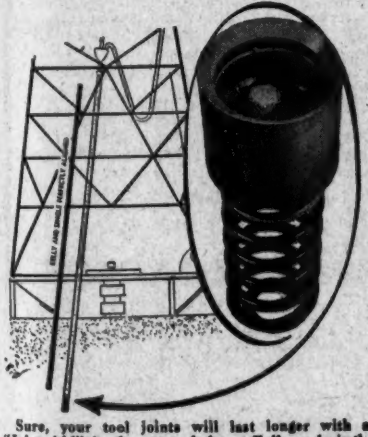

Sure, your tool joints will last longer with a "Joint Aid" in the mouse-hole . . . Kelly and single are spun up easily and quickly . . . in perfect alignment . . . *galling due to misaligned joints is completely eliminated.* You save time . . . you save wear and tear on tool joint threads . . . *you'll save the cost of a "Joint Aid" on the prevention of one galled tool joint.*

Inquire about them . . . they're made for all sizes of pipe and tubing, for any size mouse-hole. No alterations are required in the standard mouse-hole.

OWEN TOOL COMPANY

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HOUSTON, TEXAS

Beloil Corp. 2 fee. Electric-log correlations indicate this well to be running higher structurally than the 1 City of Inglewood.

Helmerich & Payne, Inc., Tulsa, has contract for Lion Oil Co.'s 8,500-ft. wildcat in southeastern Crane County, West Texas. Location is NW NW Section 14, Block X, CCSD&RGNG Survey, 3 miles southwest of Crane.

Gilliam Drilling Co. et al has an apparent pool opener in Marion County, Illinois, the 1 Berta Ebe, NE NW 14-2n-4e, 8 miles from nearest production. The wildcat produced gas and oil from St. Louis lime at 2,872-84 ft. on a drill-stem test.

Foster Drilling Co. and L. G. Wheeler have filed intention to drill 1 Emerson Sonic, NW NW NW 19-19n-4e, Payne County, Oklahoma.

B. M. Heath will drill John Buckman 1 Pfeiffer, a wildcat in SE NW NW 13-6s-13w, Posey County, Indiana.

T. F. Hunter, Wichita Falls, is the contractor for a 3,250-ft. test, the Phillips Petroleum Co. 8 King-Waggoner, Section 63, Block 14, H&TC Survey, Castleberry field, Wilbarger County, Texas.

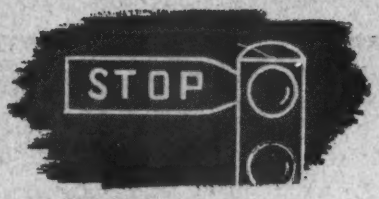
San Joaquin Drilling Co., Los Angeles, is drilling ahead below 11,216 ft. at Pacific Western Oil Corp.'s test well near Price, Carbon County, Utah, a new record depth for the state. To the present depth 349 drilling bits have been used, indicating exceptionally hard formations. In addition to this well, San Joaquin Drilling currently is operating five strings of tools in various areas in California.

Williams & Copeland Drilling Co., Tulsa, has work under way on an 8,500-ft. exploration test for Ohio Oil Co., on the Buckle L Ranch, south of Childress, Childress County, North Texas.

Big Chief Drilling Co., Oklahoma City, is the contractor for Union Oil Co. 1 Pipes, a wildcat, NE NE 19-19n-6e, 1 mile west of Oakridge, Morehouse Parish, North Louisiana.

Sallee Brothers Drilling Co., Evansville, is the contractor on Sun Oil Co. 16 Nancy Biggs, 11-P-19, Union County, Kentucky.

Byars Drilling Co., Tyler, Tex., has been awarded contract for J. E. Devant et al 1 Fagan, 3 miles northeast of Calvert, Robertson County, East Texas. Contract depth calls for 5,200 ft., believed sufficient to test Edwards limestone, but it was said that it might be carried to 10,000 ft., if Edwards is unproductive. Location is on a 369-acre tract in south Charles Hensley Survey.



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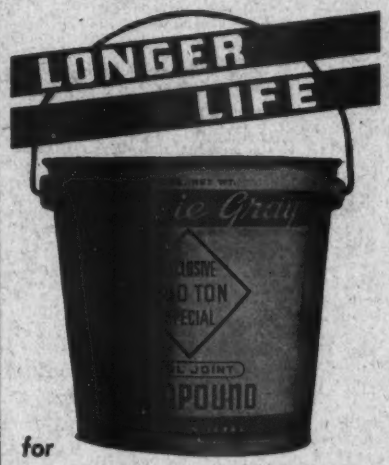

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STATISTICS and T

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 26, 1947

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1947				
	Comp.	Oil	Gas	Dry	Footage	1947	1946	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	38	19	0	*19	50,208	844	894	0	0	0	0	0	3	0	0	2	5
Pennsylvania	66	35	6	†25	94,545	1,595	2,266	0	0	0	0	0	0	0	0	1	1
West Virginia	16	2	12	2	42,302	458	396	0	0	2	1	3	0	0	5	2	7
Ohio	23	4	8	‡11	62,456	711	680	0	0	0	0	0	0	0	3	29	32
Indiana	11	4	0	7	19,668	346	202	1	0	0	1	2	13	0	0	25	38
Kentucky	11	4	3	4	16,715	354	279	0	0	0	1	1	6	0	0	28	34
Illinois	47	23	0	24	115,951	1,096	1,241	2	0	0	8	10	38	0	1	194	233
Michigan	23	11	8	4	41,127	443	450	0	0	0	4	4	5	0	9	117	131
Kansas	56	33	7	16	172,597	1,408	1,116	3	0	1	7	11	22	0	11	187	220
Neb., Mo., Iowa	0	0	0	0	0	2	9	0	0	0	0	0	0	0	0	2	2
Oklahoma	39	20	1	18	123,363	2,199	1,426	2	0	0	15	17	50	3	8	376	437
Texas	233	139	9	85	898,267	4,970	4,554	2	1	4	35	42	162	29	52	746	989
North Central (Dist. 7-B & 9)	97	45	0	§52	252,051	1,612	1,645	0	0	0	13	13	56	0	7	251	314
West (Dist. 7-C & 8)	44	38	0	6	206,858	1,171	954	0	0	0	5	5	16	0	3	89	108
Panhandle (Dist. 10)	4	2	1	1	10,010	235	193	0	0	0	0	0	1	0	1	4	6
Eastern (Dist. 5 & 6)	12	8	0	4	49,863	282	405	0	0	0	3	3	4	0	3	62	69
Gulf Coast (Dist. 3)	45	29	4	12	241,327	880	1,013	1	0	2	8	11	42	21	21	156	240
Southwest (Dist. 1, 2 & 4)	31	17	4	10	138,158	790	344	1	1	2	6	10	43	8	17	184	252
Louisiana	33	18	2	13	135,785	750	743	0	0	0	6	6	20	12	9	106	147
Northern	27	13	2	12	82,145	405	407	0	0	0	5	5	2	1	3	59	65
Southern	6	5	0	1	53,640	345	336	0	0	0	1	1	18	11	6	47	82
Arkansas	6	4	0	2	25,516	146	102	0	0	0	1	1	1	0	0	28	29
Mississippi	13	10	0	3	122,522	368	146	0	0	0	1	1	0	0	1	52	53
Southeastern States	3	1	0	2	10,762	28	25	0	0	0	2	2	0	0	0	24	24
Montana	9	2	4	3	21,434	134	166	0	0	2	1	3	2	0	3	14	19
Wyoming	7	6	1	0	25,909	119	96	0	0	0	0	0	7	0	2	18	27
Colorado-Utah	9	3	1	5	44,673	110	77	0	0	0	5	5	1	0	1	28	30
New Mexico	14	11	2	1	49,221	286	206	0	0	0	1	1	4	0	1	21	26
California	36	29	0	7	183,225	1,118	1,031	1	0	0	6	7	30	0	5	164	199
Total United States	693	378	64	251	2,256,246	17,367	16,105	11	1	9	95	116	364	44	111	2,164	2,683
Total previous week	680	380	62	238	2,293,574	16,694	15,507	14	1	6	85	106	353	43	102	2,069	2,567
Total July 27, 1946	598	309	76	213	1,898,088			8	1	2	76	87	282	24	69	1,864	2,239

Service wells included: *19, †25, ‡1, §4.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
18-18.9	$1.60	....	....	....
19-19.9	1.65	....	....	....
20-20.9	1.69	$1.55	....	$1.42
21-21.9	1.73	1.57	....	1.44
22-22.9	1.77	1.59	....	1.46
23-23.9	1.80	1.61	....	1.48
24-24.9	1.84	1.63	$1.86	1.50
25-25.9	1.88	1.65	1.83	1.52
26-26.9	1.91	1.67	1.90	1.54
27-27.9	1.95	1.69	1.93	1.56
28-28.9	1.99	1.71	1.94	1.58
29-29.9	2.02	1.73	1.96	1.60
30-30.9	2.06	1.75	1.98	1.62
31-31.9	....	1.77	2.00	1.64
32-32.9	....	1.79	2.02	1.66
33-33.9	....	1.81	2.04	1.68
34-34.9	....	1.83	2.06	1.70
35-35.9	....	1.85	2.08	1.72
36-36.9	....	1.87	2.10	1.74
37-37.9	....	1.89	2.12	1.76
38-38.9	....	1.91	2.14	1.78
39-39.9	....	1.93	2.16	1.80
40 and above	....	1.95	2.18	1.82

*Standard Oil Co. of Calif. posting. †For crude from Daboval, El Campo, and Sandy Point. ‡Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED JULY 19

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	911	2,027	332	1,105	1,861	20,952	7,214	13,353	9,978
Appalachian:									
District 1	98	309	30	86	96	2,229	277	456	277
District 2	70	219	22	39	111	897	162	163	121
Ind., Ill., Ky.	776	2,841	302	755	1,060	15,368	1,985	4,652	3,891
Okla., Kans., Mo.	433	1,514	123	540	514	7,102	834	2,189	1,239
Inland Texas	234	1,074	97	124	448	3,293	410	439	819
Texas Gulf Coast	1,215	3,783	712	1,654	1,774	13,196	2,814	7,786	6,116
La. Gulf Coast	396	1,117	307	641	508	4,371	1,740	2,800	1,535
N. La. and Ark.	67	168	46	60	102	1,617	277	336	151
Rocky Mountains:									
New Mexico	10	41	3	11	20	87	5	38	35
Other Rocky Mtn.	134	433	21	159	195	2,757	115	720	661
California	782	2,221	96	738	2,260	15,276	838	13,573	26,719
July 19, 1947	5,126	15,747	2,091	5,912	8,969	87,145	16,672	46,505	51,542
July 12, 1947	5,229	16,197	2,194	5,909	8,679	88,791	16,057	45,261	50,529
July 20, 1946	4,817	14,227	1,978	5,329	8,089	89,519	15,678	43,481	49,284

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 231,852,000 bbl. as of July 19—down 509,000 bbl. One year ago 222,740,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.

East Texas	$1.95
Kettleman Hills, California*	2.14
Beauregard Parish	1.90
Illinois Basin	2.07
Pecos County, Texas (Yates)	1.65
Bradford, Pennsylvania	4.30
Eastern Ill. and Western Ind.†	2.07
Tomball, Texas Gulf Coast	2.10

*37°-37.9°. †35° and above.

TRENDS

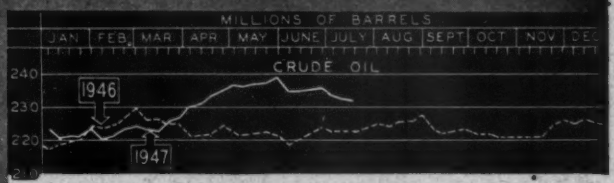
DAILY AVERAGE PRODUCTION FOR WEEK

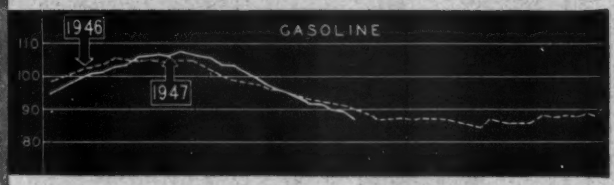
	July 26 crude-oil	B. of M. July demand	July 12 crude oil
Alabama	1,150	1,200	1,100
Arkansas	80,950	80,000	81,050
California	921,600	900,000	918,000
Colorado	41,900	42,000	41,570
Eastern	65,700	65,400	62,800
Florida	1,075	600	1,000
Illinois	182,600	208,000	181,500
Indiana	17,350	18,000	17,600
Kansas	296,400	290,000	294,750
Kentucky	26,200	28,000	25,900
Louisiana	429,450	425,000	421,850
North Louisiana	104,900	.....	97,300
South Louisiana	324,550	.....	324,550
Michigan	42,410	45,000	37,360
Mississippi	97,610	90,000	95,860
Montana	23,730	24,000	23,160
Nebraska	550	600	550
New Mexico	108,150	104,000	108,150
Oklahoma	384,750	390,000	388,100
Texas	2,255,250	2,190,000	2,224,050
Dist. 1 (Southwest)	22,000	.....	22,390
Dist. 2 (Southwest)	138,825	.....	163,360
Dist. 4 (Southwest)	209,650	.....	241,625
Dist. 3 (Gulf Coast)	487,150	.....	479,675
Dist. 5 (Eastern)	39,175	.....	39,155
Dist. 6 (Eastern)	112,700	.....	113,400
East Texas field	324,000	.....	324,000
Dist. 7-C (West)	39,200	.....	38,840
Dist. 8 (West)	637,250	.....	555,250
Dist. 7-B (W. Central)	37,100	.....	37,075
Dist. 9 (N. Central)	124,000	.....	125,500
Dist. 10 (Panhandle)	84,200	.....	83,780
Wyoming	117,290	118,000	114,070
Miscellaneous	.....	200	.....
Total United States	*5,094,115	5,020,000	5,058,420
Change from prev. wk.	up 35,695		

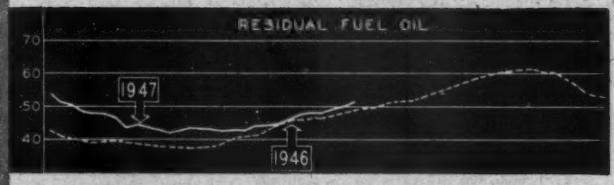
Total production January 1-July 26 ..... †1,022,596,065 bbl.
Same period last year (crude plus cond.) 996,173,950 bbl.

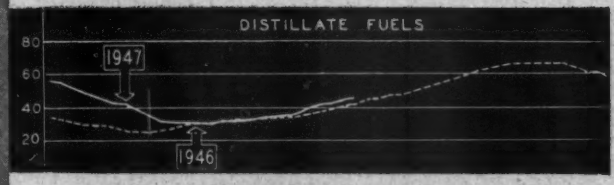
*Not incl. 31,050 bbl. cond. †Incl. 6,008,270 bbl. cond.

OIL STOCKS IN THE UNITED STATES

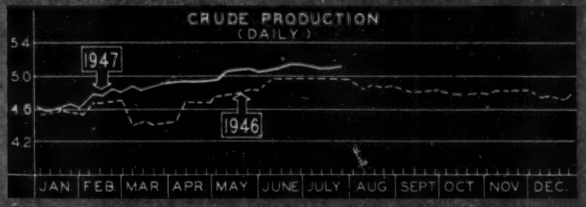


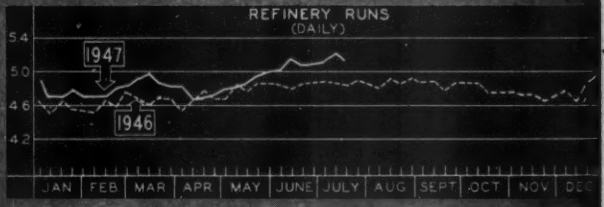






DAILY OPERATIONS





Solid line charts weekly completions, service wells in Eastern area included.

PENBERTHY
AUTOMATIC
INJECTORS

The accepted method for assuring an uninterrupted supply of feed water to oil field boilers. Penberthy Automatic Injectors will supply feed water to boilers at minimum cost, are quickly and easily installed, reliable under most severe operating conditions, require little attention and no careful handling. Highest quality design and rugged construction.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

HIGH PRESSURE
UTILITY PUMP

$327.75 F.O.B. Det.

IMMEDIATE DELIVERY

UTILITY PLUS

FIRE Protection

- FOR DAIRYFARMS
- JETTING BY BRIDGE & DOCK CONTRACTORS
- PLACER MINING
- TESTING WATER MAINS
- STAKE JETTING BY FISHERMEN
- OIL WELL SURVEY

PORTO-PUMP

Small towns and resorts, financially unable to own and maintain high priced fire pumper, can now afford fire protection. Porto-Pump can be mounted in rear of light truck, motor scooter or trailer.

Independently powered, self sufficient and engineered for continuous use at consistent high efficiency, the rubber impellers deliver over 40 U. S. gallons per minute at 120 lb. pressure by actual flow-meter test.

Where hydrants are not available, use water from ditches, lake or cistern. Pressure and volume losses due to abrasive action of dirty water are avoided by Porto-Pump's rubber impellers.

SOME DISTRIBUTOR TERRITORIES AVAILABLE

PORTO-PUMP, INCORPORATED
227 IRON STREET, DETROIT 7, MICH

MARKETS

PRODUCTS prices moved generally higher in the Mid-Continent and Gulf Coast spot markets last week, with the upward trends encouraged by an increasing scarcity of products, particularly gasoline and kerosine.

No signs were in evidence of an immediate loosening up in any product, but there were indications that kerosine and light burning oils would advance further within the next few weeks. No. 2 was particularly scarce in the Mid-Continent and what little was available was moving at 7 cents and above.

Along the Gulf Coast both premium gasoline and kerosine were reported "unavailable." Kerosine was described by suppliers as "extremely scarce." Forecasts of "no change" were offered by suppliers of gasoline, who declared practically all gasoline produced on the Gulf Coast is committed at least through August. Shipments of regular-grade last week were moved at 9¾ cents, with one supplier quoting 10 cents for the same product.

No Kerosine Moving

Bidders were offering 8 cents, in some cases, for kerosine, but no sales of the product were reported. No. 2 was quoted at 6½ to 7 cents.

No. 6 residual continued to command a high price on the Gulf Coast spot market, with top sales reported at $2.60. Quotations of $2.65 also were heard. Only two refiners were reported having any quantity for movement on the spot market. Price for No. 6 ranged down to $1.90 as suppliers continued shipment of the product to old customers and contract accounts at "reasonable" prices.

Both in the Mid-Continent and along the Gulf Coast most observers felt that the upward trend of prices would end shortly, with prices leveling off. Most agreed there might be some upward adjustment in the "low" quotations.

The lubricating-oil market along the Gulf Coast was reported loosening up last week with some oils available, a situation not found 2 weeks ago.

Jersey Standard Holding Prices

Market observers generally expected the newly announced attitude of Standard Oil Co. of New Jersey to have a limiting effect on posted products prices. The announcement said the company would "hold the line" on its products because "further increases in the price of crude oil or products under present conditions are not in the best interest of either the oil industry or the public.

Along the East Coast, Standard prices remained lower than those of Socony-Vacuum, which initiated a recent increase in products prices. Although prices remained virtually unchanged, there still were indications that other companies would follow Socony-Vacuum's lead.

Indicating the increased demand was the report of the Bureau of the Census showing that service stations recorded a 12 per cent increase in sales during June, compared with the same month last year, even though sales were 2 per cent below those of May.

In spite of the continuing steel shortage and other factors, factory sales of passenger cars continued to gain in June, showing a 7.6 per cent increase over May. June sales were 305,943. Total sales during the first 6 months were 1,720,210.

Representative Quotations

Representative spot-market quotations of leading suppliers as of July 28, 1947. Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	8.125	10.1-10.4* 9.3-9.5†	9-9.75
Premium gasoline, 78-80 octane	8.875-9.75	10.2-12	9.5-10
42-44 w.w. kerosine	7.125-7.375	7.8	7.5-8
No. 2 straw fuel oil	6.375-7.25	6.8-7.1	6.5-7
No. 6 residual	$2.15-2.35	$2.32-2.50	$1.90-2.60

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.875	5.375	5.625
Grade 18-55	7.05	6.45	6.75

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	11.5-12.5
750 vis., No. 3-4 neutral	13.5-15.25
2,000 No. 5-6 neutral	15-16.75

LUBRICATING OILS

Mid-Continent

150-160 vis. D bright stock, 0-10 p.p.	20
200 vis. No. 3 neutral, 0-10 p.p.	18-19

Western Pennsylvania

145-155 vis. 10 p.t. bright stock	42
180 vis. 0 p.t. neutral	43

CRUDE-SCALE WAX

Mid-Continent

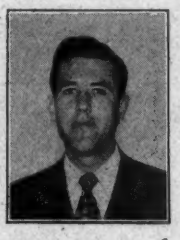
130-132 A.S.T.M. melting point	6.75-7.75

EQUIPMENT MEN ... in the News

Patterson-Ballagh Appoints California Sales Manager

C. S. "Cliff" Divelbiss has been appointed California sales manager by Patterson-Ballagh Corp., Los Angeles. He assumed his new responsibility following the A.P.I. convention at the Yellowstone National Park. Divelbiss has worked in the oil fields since 1925, and has represented Patterson-Ballagh as a field man in the Los Angeles Basin for the past 3 years. R. W. "Bob" Shira, formerly advertising and sales promotion manager for the firm, will assume Divelbiss' duties in the Los Angeles Basin. From 1938-42, Shira was in the sales department of the Hughes Tool Co. in California. During the war he was in the armed forces in Canada and Alaska, returning to Hughes in November 1945. Since June 1946, he has been handling the advertising of Patterson-Ballagh.

C. S. DIVELBISS



R. W. SHIRA

Carter Elected Vice President

Robert F. Carter general construction superintendent of The Lummus Co., New York, has recently been elected vice president of the National Constructors Association. While with Lummus, he has filled the capacity of operator, job engineer, and superintendent on both domestic and foreign work. He has recently been made general construction superintendent, in which capacity he has charge of all construction work for the ocmpany.

Lewis Petroleum Sales Manager

Edwin J. Lewis has been appointed manager of petroleum-company sales for the replacement tire sales division of The B. F. Goodrich Co. Lewis succeeds Howard F. Miller, who has been assigned other duties. With the organization 18 years, Lewis has held a number of advertising, sales promotion, and sales posts, and for the last year has been assistant to the manager of passenger-car tire sales.

Sales Organization Expanded in South America

J. C. AXELSON

J. C. Axelson, president and general manager of Axelson Manufacturing Co., announces the completion of negotiations for an extensive sales and service organization in Venezuela and Colombia. M. Roy Conger will directly represent the company in sales and service and will be located at Caracas, Venezuela. In Maracaibo, the company is represented by C. C. McDermond. McDermond's efforts are supported by John McNeill.

C. A. Industries, Waldrip y Campbell, recently formed by William S. Waldrip of Waldrip Engineering Co., Los Angeles, and W. J. Campbell, president of Petroleum Machinery Corp., New York, have established headquarters at Caracas, Venezuela. The Waldrip-Campbell organization will stock, sell, and service the complete line of Axelson equipment in Venezuela and Colombia. In the organization is C. T. Moody, who worked in the sales organization and factory in Los Angeles for 22 years.

Whitten Promoted By Bovaird

R. E. WHITTEN

R. E. Whitten has been promoted from manager of the Bovaird supply store at Borger, Tex., to district manager. Whitten has been with the organization since 1935, and has been associated with the supply end of the oil industry for a quarter century. He succeeds Dan C. Kennedy, who died recently.

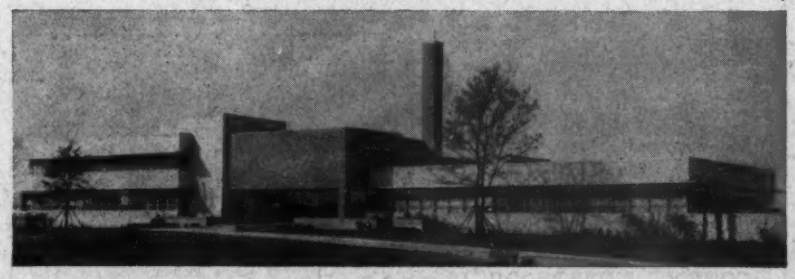
Wailes Dove Becomes Part of Koppers

Wailes Dove-Hermiston Corp., a subsidiary of Koppers Co., Inc., has ceased to do business as a separate corporation and now operates as a part of Koppers Co. The Wailes Dove organization has taken over all the protective coatings of the Tar Products Division and is now known as the Wailes Dove-Hermiston Department. Linden Stuart heads the department and William Thornhill continues in charge of sales. The Wailes Dove-Hermiston plants continue the production of the former subsidiary's products.

Whitney Chain to New Quarters

Whitney Chain & Mfg. Co. has announced the removal of its branch office and warehouse to new headquarters at 2914 Taylor Street, Dallas.

(Continued on page 135)



New functionally designed plant of Geophysical Service, Inc., recently has been completed in Dallas. Executive officers who will office in the new building include: Eugene McDermott, president; C. H. Green, vice president; and J. E. Johnson, vice president. Dr. H. B. Peacock, vice president, is located in Houston

Classified Advertising

The Market Place for the Oil Industry

UNDISPLAYED

All ads except Situations Wanted, 10 cents a word. Minimum charge, $2.00 per insertion.
Situations Wanted ads, 5 cents a word. Minimum charge, $1.00 per insertion.
Centered Line, any ad, 75 cents.
Box Numbers count 9 words when replies are to be sent to our Tulsa Office. Replies forwarded without charge.

DISPLAYED, PER INCH

$9.00 per column inch per insertion. One-point border and 12-point capitals are allowed. Larger type sizes not accepted.

All classified advertising payable in advance.
10% Discount if 3 insertions are ordered at one time.
COPY DEADLINE, 9:00 a.m. Monday prior to each week's issue.

THE OIL AND GAS JOURNAL
P. O. Box 1260, TULSA, OKLAHOMA

EQUIPMENT FOR SALE

FOR SALE: Six New Kobe, 2½ inch tubing insert, pumps, one Triplex—Bargain for immediate sale. Ben Beckham, Jr., Box 134, Overton, Texas. Phone 3921.

FOR SALE: Shaffer power draw works, powered by two J. L. 1335 Buda engines compounded. Suitable for 5,000 foot work. In A-1 condition. Price $7,500. Terms. Melton Well Service, Box 1360, Seminole, Oklahoma.

FOR SALE: Franks Single Drum 4000′ Pulling unit, 10″ x 8″ x 60′ mast, Double friction clutches, mounted on 5 Ton GMC Tandem truck. This unit is new, having done about 5 mo. work. J. A. Rives, Borger, Texas.

FOR SALE: Ingersoll-Rand Imperial Type XG combination two cylinder gas engine and two stage gas compressor. Engine cylinders 20″ stroke by 17″ dia. Compressor cylinders 20″ stroke; low stage 14″ dia. and high stage 7″ dia. In good running condition. Knapps Creek Oil Corporation, Box 367, Bradford, Pennsylvania.

STEEL TANKS

9—883,000 gal., 55 ft. dia. x 50 ft. high 29/32 in. thick, cone bottom. Can be supplied with or without 6-compartment Dorr thickener mechanisms.
6—160,000 gal., 35 ft. dia. x 21 ft. high welded, cone bottom, ⅝ in. walls Can be furnished with or without Dorr thickener mechanisms.
1—450,000 gal., 50 ft. dia. x 30 ft. high, ⅝ in. walls.
4—106,000 gal., 30 ft. dia. x 20 ft. high.
1—16,200 gal. 10 ft. dia. x 27 ft. long, horizontal lead lined. Can be used for acid storage.

All of these tanks are UNUSED. Installed new in 1944 in a War Plant. Location: Mobile, Ala. Immediate Shipment.

WIRE, PHONE or WRITE
For details and prices

CONSOLIDATED PRODUCTS CO., INC.
17-30 Park Row, New York 7, N. Y.
Telephone: BArclay 7-0600

EQUIPMENT FOR SALE

CULVERTS For Sale: 18″ corrugated galvanized, sectional culverts. Will make any desired length and sustain heavy loads. Phone 3-9169, Tulsa, Oklahoma.

FOR SALE: 3000′ good used 3″ drill pipe with Hydril Tool Joints—average lengths 30′9″. Price 60c per ft. Central Pipe & Supply Company, Phone 5851, Box 1466, Lubbock, Texas.

FOR SALE: On Lease near Gladewater, Texas, 100 HP Superior Gas Engine and National G-100 Geared Power. Contact Gladewater office or Patridge, Cities Service Oil, Bartlesville, Okla.

PIPE: Large quantities 2″ to 4″ new seamless tubing, 1,000 lb. pressure same as regular pipe. Attractive price. Immediate delivery. Research, 5921 Troost, Kansas City 4, Missouri. Phone Delmar 4266.

PRICED TO SELL: 20—Size 2,000 gal. Gasoline Tanks mounted on Semi Trailers, 4 tires, size 900 x 20, Budd Wheels. Complete with transfer unit, hose, air brakes. Good for Oil, Tanks, Water, Gasoline, etc. Mfg. by The Heil Company. Independent Tank Company, Seminole, Oklahoma, Box 102, Phone 977.

1 STAR 45 ST Spudder with Hercules engine. Both in excellent condition. No tools. Located 10 miles East of Drumright, Okla. 1 Ft. Worth Super D Spudder with practically two strings of tools, located on Lysite Mountain, Wyoming. Travco Equipment Company, 110 Mideo Bldg., Tulsa, Oklahoma. Phone 5-2251.

FOR SALE: 1 No. (I) Buckeye Ditching Machine in good shape, $1750.00. 1 Truck mounted Rotary Drill with 1,000 feet of -A- rods, 3 core barrels fully equipped ready to go. $3500.00. Missouri Valley Gas & Oil Company, 9525 East 15th Street, Independence, Missouri.

FOR SALE: Model 55 Wichita Spudder less mast with PA-100 International engine in good condition. Located close to Pampa, Texas. Nabob Oil & Gas Company, Box 448, Amarillo, Texas.

TANDEMS FOR SALE
2—1941 Autocar Tandem Trucks with winches and oilfield beds. Good condition and tires. Address inquiry to P. O. Box 1063, Oklahoma City 1, Okla.

FOR SALE OR TRADE
NATIONAL ROTARY RIG
Complete with derrick and drill pipe.
D. M. HAWKINS
310 Thompson Bldg. Phone 3-0069
Tulsa, Okla.

FOR SALE
STEEL STORAGE TANKS
18—10,000 Gallon Capacity Tank Car Tanks
CLEANED PAINTED TESTED
Located in Oklahoma
IRON & STEEL PRODUCTS, INC.
42 years' experience
13413 S. Brainard Avenue
Chicago 33, Illinois. PHONE BAYport 3456
"ANYTHING containing IRON or STEEL"

EQUIPMENT FOR SALE

FOR SALE: New 3″ Drill Pipe with Tool Joints standard weights R-2. Box B-734, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: New 5″ x 10″ Worthington TYPE KMS-1 Pump. Box B-733, The Oil and Gas Journal, Tulsa, Oklahoma.

WICHITA SPUDDER and string of drilling tools, sell or trade near St. Louis. J. B. Woolsey, 804 N.W. 35th, Oklahoma City, Oklahoma.

FOR SALE: Ingersoll-Rand Imperial Type 10, 2 stage belt-driven compressor with 110 hp. twin cylinder Bessemer gas engine with 20′ x 54′ wood frame galvanized iron building, 4 scrubber tanks, circulating coils with heavy welded tank 10′ x 34′ x 10″ deep, air compressor with volume tank complete. Phone or write W. R. Bowman, 214 Kennedy Bldg., Tulsa, Oklahoma. Phone 2-3633 or 6-6960.

FOR SALE: 6000 Ft. 6⅝″ O.D. 13# Lapweld Plain End Cement Lined Second-Hand Line Pipe, 80 cents Ft. F.O.B. Fittstown, Oklahoma. The National Supply Company, 504 East Archer, Tulsa 3, Oklahoma. Phone 2-8101.

FOR SALE: One No. 200 Sullivan Core Drill complete. One No. 37 Sullivan Core Drill complete. Both machines mounted on Truck. For information, phone 3-7810 or 6-3719. Mailing address, F. D. Bridges, 1109 Euclid St., Oklahoma City, Okla.

30,500 ft. new seamless steel tubing, cold drawn, 1020 size 2.432 x .4225 wall, 12′ to 19′ Random Lengths. $75.00 net ton FOB Linden, New Jersey. Also approximately 250 ton misc. tubing sizes 1″ to 7⅛″ smaller sizes light wall larger sizes .220 to 25/32″ wall. Write for complete description. $70.00 ton FOB Ohio. South Texas Pipe & Supply Company, Box 3188, Corpus Christi, Texas.

FOR SALE

50—Used Model W-25 Allis-Chalmers gas engines complete with combination carburetor, radiator, dutch power take-off with V-Belt sheave, protective controls, and hand starting crank. All were in good operating condition when removed. Will sell single engines or in lots.

GLENN SUPPLY COMPANY
P.O. Box 1104 Tulsa, Okla.
Phone 3-9607

THE WONDER PUMP

Vane type rotary pump—400 Gals. per hour—pulls 29″ of wet vacuum of water. Weighs 3¾ pounds. For water, gasoline and oil up to 300 Viscosity. We have the largest stock of reconditioned and non-reconditioned steam, centrifugal and rotary pumps in the Southwest.

We also repair and recondition Customer pumps.

BUYERS SERVICE & ENGINEERING CO.
Joe Forney—114 W. Archer—Tulsa, Okla.
Phones 3-8123—3-6755. Res. 3-0434.

PARTS FOR ARMY TRUCKS
New and Used

Largest stock in America, 6x6, 6x4, 4x4, 4x2. All items guaranteed. Largest auto wrecking house in the west with most complete stock of new and reconditioned parts for all cars and trucks. Fast service.

PIONEER AUTO WRECKING CO.
752 W. 13th Ave. Denver 17, Colo.